

ORIGINAL

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

**Title: MEETING WITH
THE ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS --
PUBLIC MEETING**

Location: Rockville, Maryland

Date: Thursday, November 4, 1999

Pages: 1 - 80

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1025 Connecticut Avenue, NW, Suite 1014
Washington, D.C. 20036
(202) 842-0034

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
OFFICE OF THE SECRETARY

MEETING WITH
THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland
Thursday, November 4, 1999

The Commission met in open session, pursuant to notice, at 9:33 a.m., Richard A. Meserve, Chairman, presiding.

MEMBERS PRESENT:

- RICHARD A. MESERVE, Chairman of the Commission
- NILS J. DIAZ, Commissioner
- GRETA J. DICUS, Commissioner
- EDWARD McGAFFIGAN, JR., Commissioner
- JEFFREY S. MERRIFIELD, Commissioner

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1 STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:
2 ANNETTE L. VIETTI-COOK, Secretary of the Commission
3 KAREN D. CYR, General Counsel
4 DANA POWERS, Chairman of the ACRS
5 GEORGE APOSTOLAKIS
6 JOHN BARTON
7 MARIO BONACA
8 THOMAS KRESS
9 ROBERT L. SEALE
10 WILLIAM SHACK
11 JOHN SIEBER
12 ROBERT E. UHRIG
13 GRAHAM B. WALLIS

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P R O C E E D I N G S

[9:33 a.m.]

CHAIRMAN MESERVE: Good morning. On behalf of the Commission I would like to welcome everyone here to today's meeting with the Advisory Committee on Reactor Safeguards. As I think all of you know, this is my first official Commission meeting and I am actually particularly pleased it is going to be with this group because it gives me an opportunity to meet both with some old friends and some new friends.

I should indicate the old friends refer to the two gentlemen who are directly across the table from me. Both Dana Powers and George Apostolakis are people with whom I have worked in various projects in the past and I know that they are both incredibly diligent and very hard-working and very capable and I am very pleased that we have the opportunity at this occasion to interact in a different forum yet again.

As to new friends, I am of course referring to my fellow Commissioners. I would like to express my appreciation in particular to Commissioner Greta Joy Dicus for her leadership as Chairman and for the very substantial assistance that she has provided to me basically during her period of Chairmanship, providing continuity and stability in the Agency and also making this a very smooth transition,

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1 and I would also like to include within my new friends my
2 colleagues here as fellow Commissioners, all of whom have
3 been extraordinarily helpful to me, and I am very
4 appreciative to the assistance that all of you have
5 provided.

6 I think it is appropriate at the outset that I
7 recognize two members of the ACRS. First, I would like to
8 welcome Mr. John Sieber, who is a newly-appointed member,
9 who was formerly an executive with Duquesne Light Company,
10 and he brings extensive industry experience to the
11 committee. He is standing there. The Commission very much
12 looks forward to working with you.

13 DR. SIEBER: Thank you, sir.

14 CHAIRMAN MESERVE: Secondly, I would like to
15 congratulate my friend, George Apostolakis. He is the
16 recipient of the American Nuclear Society's 1999 Tommy
17 Thompson Award for his leadership and direction in risk
18 analysis and contributions to nuclear plant safety. I
19 understand this is a very prestigious award. It is
20 conferred by the American Nuclear Society and I am sure it
21 is richly deserved.

22 DR. APOSTOLAKIS: Thank you.

23 CHAIRMAN MESERVE: We appreciate your -- I know it
24 is deserved and we appreciate your contributions here. I
25 know we are going to be hearing from you about that later

1 this morning.

2 I recognize that the ACRS has provided valuable
3 and timely advice to the Commission on a variety of
4 technical and policy matters over the years. I am sure that
5 it will continue to do so and help us in fulfilling our
6 mission, providing -- assuring safety in nuclear power
7 operations and you do that by providing independent
8 perspectives on the issues that are before us, and these
9 meetings are valuable because it provides us with an
10 opportunity to interact with you on various of the written
11 submissions that you have made over the years.

12 During today's briefing the ACRS will discuss the
13 strategy for ACRS review of license renewal applications.
14 It will discuss the general strategy for risk-informing 10
15 CFR, Part 50, and for dealing with 10 CFR, 50.59, and will
16 deal with the relationship and balance between probabilistic
17 risk assessment and defense-in-depth.

18 Schedule permitting, we will go into some other
19 subjects as well.

20 We look forward to this meeting and look forward
21 to an open and candid discussion with you. For those in the
22 audience, I understand that copies of the handouts are
23 available and I hope that all of you got them and they are
24 at the entrances of the room. I suggest that we proceed by
25 having each of the presentations completed and then we will

1 turn to questions of that presenter by the Commission. You
2 will have an opportunity to make a coherent presentation.

3 Unless my colleagues have some opening comments,
4 we will proceed.

5 COMMISSIONER MERRIFIELD: Actually I do. I would
6 like to return the favor by welcoming the new Chairman and
7 thanking him for his gracious comments. We have looked
8 forward to joining you, having you join us on the
9 Commission. I am particularly pleased that a fellow alumnus
10 of Tufts University is on this panel --

11 [Laughter.]

12 COMMISSIONER MERRIFIELD: -- "Go, Jumbos."

13 I would also like to make a comment relative to
14 former Chairman, now again Commissioner Dicus. I second the
15 comments of the Chairman regarding the terrific job that you
16 have done over the past few month making sure that this
17 Agency continues to run in a smooth manner, and I think the
18 transition has been as good as it could possibly be, and you
19 are certainly to be congratulated for the work that you did.

20 I have one other thing I want to say, but I will
21 let you go --

22 COMMISSIONER DICUS: No, you go ahead.

23 COMMISSIONER MERRIFIELD: I just want --

24 COMMISSIONER DICUS: And then we will get into the
25 meeting.

1 [Laughter.]

2 COMMISSIONER MERRIFIELD: I do want to say that I
3 was a little disappointed. I had taken my materials, my
4 briefing materials, home on Tuesday. I had to be out of the
5 office yesterday, and took some amount of time Tuesday night
6 and Wednesday night preparing for this meeting, which is
7 difficult to do given the fact I have got an 11-week old
8 daughter at home who keeps me up late at night.

9 I was disappointed to find out that a substantial
10 portion of the slides of this presentation, which I prepared
11 on, were changed yesterday and I would like to -- I
12 expressed my disappointment that there were the late changes
13 and would certainly like to encourage ACRS to try to get
14 those to us in a more timely manner so that we can be fully
15 prepared.

16 I don't feel I am fully prepared, having gotten
17 the changed materials when I got to my desk at 7:30 this
18 morning and apologize for that.

19 COMMISSIONER DICUS: Okay. I certainly thank --
20 welcome our new Chairman, which I did officially on Friday
21 when he was sworn in, and pleased to have him. The
22 transition has been remarkably smooth and certainly I
23 appreciated his comments to me and, my fellow Commissioners,
24 you all made the time I served as Chairman very easy,
25 because your support of me and your help with me was truly

1 appreciated, together with the Staff. The Staff made it
2 easy as well, so I appreciate the time that we spent and I
3 appreciate the comments. Thank you.

4 Now we can get started with the meeting.

5 CHAIRMAN MESERVE: Thank you. Dana?

6 DR. POWERS: I guess it's fair to say that George
7 and I have looked forward to calling you Chairman Meserve
8 once again in another context. Over the last nine months,
9 the ACRS has been working intensively and closely with the
10 Staff, even collegially with the Staff, to resolve issues
11 that the Commission had highlighted with Congress. That
12 includes the resolution of a variety of generic safety
13 issues, revision of the approach the Staff uses for the
14 inspection and assessment of nuclear power plants, and even
15 the incorporation of concepts of risk into the enforcement
16 of its requirements and the revision of the very important
17 Rule 50.59.

18 This period of intense work on issues that had
19 been highlighted to the Congress is largely complete now,
20 and ACRS is in the process of reverting to more usual manner
21 of working with the Staff, and in doing this we are focusing
22 on a set of four or five topics. We want to discuss two of
23 those in particular with the Commission today, and those are
24 license renewal and the risk-informing of NRC regulations.

25 Well, at this point I think I want to turn

1 directly to the discussion of the license renewal process
2 and I will ask Mr. Bonaca if he will pick up at this point
3 and review with us our approach to the license renewal
4 process.

5 DR. BONACA: Good morning.

6 The ACRS will review every license renewal
7 application and related SER and also will participate in the
8 development of the license renewal process. Clearly our
9 involvement with each license renewal application will
10 continue through the years as applications will come in.
11 Our contribution to the development of the license renewal
12 process will be mostly over the next year, year and a half
13 before the Standard Review Plan becomes finalized in 2001,
14 so that is really where we see our major contribution to the
15 process will take place, and after that there will be a
16 standardized process in place and so our efforts right now
17 are to contribute to that process development now.

18 As we face the commitment of reviewing many
19 applications coming our way, we had to devise some strategy
20 to assure that we can perform timely reviews of the expected
21 number of applications and also to continue the involvement
22 of the ACRS in other as important issues, and that was not
23 necessarily an easy thing at the beginning because of the
24 number of applications coming our way.

25 On the other hand, I believe that under my second

1 bullet, which is Contribution to the Development of the
2 Process, it is going to take us, keep us busy over the next
3 year. After 2001 we will not be involved in that.
4 Therefore, the time that the ACRS would require to review
5 individual applications will be reduced in time just because
6 the process will be pretty much well-defined, and we will
7 not specifically be involved anymore in process issues.

8 So with that in mind, if we could turn to my
9 second overhead, the elements of our strategy include the
10 following. For the initial applications, which means those
11 which are now in front of us as well as those that will come
12 before 2001, and for the first of a kind nuclear steam
13 supply system designs, which is a Westinghouse plant, a CE
14 plant, a B&W plant, and then maybe one GE or two, depending
15 on how much the containment affects the specific review that
16 we have for the first of a kind.

17 For these applications we will have a four-step
18 process. By four-step process we mean two subcommittee
19 meetings, typically the first one lasting two days, and the
20 first one is timed with the review of the first SER.

21 Typically we will have also two full Committee
22 meetings, one that follows the interim SER, and the reason
23 is that we have found, for example for the Oconee
24 application, that when we review the SER we have a number of
25 comments that we can provide on process and the opportunity

1 for us to provide that information is with an interim letter
2 or report of the ACRS, so this four-step review of initial
3 applications will include two reports, an interim report to
4 brief them after the SER has been reviewed and a final
5 report, to be written when the supplemental SER is reviewed
6 and all the open issues are closed.

7 We do believe it is a reasonably intensive effort,
8 but I think it is required because of the newness of the
9 applications and because the process again is not
10 well-defined and I believe we need to comment on that.

11 After we get to 2001 and the process is complete,
12 is in place, as part of the SRP, Standard Review Plan, we
13 believe that a two-step review of subsequent applications is
14 going to be adequate, in fact sufficient. That would
15 consist of a two-day subcommittee meeting of the ACRS that
16 will take place after the SER is issued, with open issues of
17 course, at that point, and then a full Committee meeting to
18 be held after the open issues are closed at which point we
19 will write our letter or report, so for all subsequent
20 applications, what we call here subsequent to the
21 establishment of the final process, we will have only one
22 report of the Commission.

23 Now I would like remind the Commission that this
24 was the process that was used originally by the ACRS to
25 review new applications for new power plants and we feel

1 that that process was sufficient and should be sufficient
2 for a license renewal.

3 Between now and 2001 of course we will have a
4 significant number of interactions with the Staff. We
5 already in the past two months have a couple of meetings
6 with the Staff that had to do specifically with generic
7 issues on license renewal to essentially really come up to
8 speed on our part on the existing interaction between the
9 industry and the Staff, and the other meeting that we had
10 was on credit for existing programs. As you know that issue
11 was a contentious issue between the industry and the Staff
12 and we provided an independent view.

13 We intend to still serve you in that role as you
14 see fit when open issues of that nature come in and they are
15 contentious issues, so we can provide an independent view.

16 One element of our strategy, of course, to contain
17 our level of effort is not to duplicate the Staff review. I
18 mean the Staff is doing a very thorough review of
19 applications and it would not be a proper expenditure of our
20 resources to try to duplicate that, but to focus on
21 significant technical and process issues. Clearly there are
22 technical issues to do with void swelling of austenitic
23 stainless steel and internals, with the fatigue of
24 components, with the thermal aging of stainless steel.
25 Those issues are central to the license renewal and we need

1 to review them and see how they are dealt with on the
2 individual applications and we feel comfortable the way they
3 were dealt with for the Oconee or they are being dealt with
4 for the Oconee and Calvert Cliffs applications.

5 There are process issues which are also very
6 important that we want to focus on. You know, one that
7 comes to mind is the scoping issue. As you know, right now
8 there is still work going on between the Staff and Oconee,
9 particularly Duke Power, to determine what is the set of
10 components that should be within the license renewal.

11 The reason why it is not so clear is that plants
12 have different age, they were licensed under different
13 standards. For example, the Oconee units were licensed
14 prior to the Standard Review Plan finalization. Therefore,
15 we don't have a set of clearly-identified safety-related
16 components that you could just take in and put in the
17 scoping.

18 There are other issues that certainly will come on
19 scoping. For example, we have plants like South Texas
20 Project that right now is changing its own licensing -- the
21 current licensing basis to include risk information. If
22 they come tomorrow for license renewal they are likely to
23 expect that this new scope, which has really risk
24 information in it, will become part of their license renewal
25 scope.

1 So these are the issues that we feel that we can
2 contribute on and focus on, and that is really where our
3 resources should be expended.

4 I would like to move on to my third slide, and
5 with that complete my presentation with two observations.

6 First, the ACRS is encouraged by its review of the
7 initial applications. Why? Mostly because the existing
8 plants' aging degradation management programs are extensive,
9 and it is apparent to us now that these plants are ready for
10 life extension. I mean the programs they have put in place
11 for managing aging mechanisms are so extensive that with
12 some modifications or a few new programs, typically
13 involving one time inspections, these plants are ready for
14 license renewal. So it doesn't seem to us any more as a
15 step change, but more of an evolution to allow for the 20
16 extra years of life to occur.

17 And, second, we are encouraged by the staff that
18 is developing an effective rule implementation process. We
19 feel that they have been tenacious on certain issues where
20 they had to be tenacious and they have been quite effective
21 in working with the industry at developing an effective
22 license renewal process. With that, my remarks are
23 completed. Thank you.

24 CHAIRMAN MESERVE: Thank you very much.
25 Questions? Greta.

1 COMMISSIONER DICUS: Yes, let me address that
2 thing. I had a couple of questions, but one, I think I will
3 just do one right now. It has to do -- some of our
4 stakeholders, including members of Congress and some of our
5 international colleagues have questioned this requirement
6 that we have that, you know, within about 20 years of
7 license expiration, if you are going to renew your license,
8 you should submit a license renewal application. And then
9 we know that we have Duke Power, they suggested, they have
10 come in, we have approved an exemption that they can come in
11 before 20 years in order to have a combined application
12 situation.

13 And then others have said, well, how can you
14 possibly make a decision about license renewal so far in
15 advance of when the license actually expires and we should
16 wait until it is closer to the time of expiration. Or if
17 you agree with the license renewal at this point, I mean
18 what about ten years down the road, you find something
19 different.

20 So, would you like to give me some of your
21 thoughts on this 20 year requirement, whether we need it or
22 not, particularly in light of the fact that when we thought
23 it might take us five years to get a license renewal, we are
24 down to 24 months and may drop that even shorter. So, do we
25 need this, or what about this?

1 DR. BONACA: Well, I mean, first of all, in
2 general, that is a good question, and I have actually,
3 myself, when I started taking the lead on this issue a few
4 months ago, asking myself that question. But central to the
5 rule, it seems to me, is the effective management of aging
6 effects.

7 COMMISSIONER DICUS: Exactly.

8 DR. BONACA: And to the degree to which you can
9 demonstrate that you have an effective aging management
10 program, then the question is not the timing, when you
11 started that. But, now, clearly, in aging demonstration, an
12 aging managing program implies also monitoring to assure
13 that if you should discover things that are different from
14 what you expected, you will, in fact, correct, what you are
15 doing and change it. And you have all kinds of provisions
16 that will come in from the management standpoint, so the
17 issue is really the management issue that we are focusing
18 on.

19 COMMISSIONER DICUS: So even after -- if we renew
20 a license, we still have the aging management issues and
21 that goes whatever the timeframe is.

22 DR. BONACA: Right.

23 COMMISSIONER DICUS: I would agree. Okay. Thank
24 you.

25 DR. POWERS: I think it is also important to

1 understand that there are a lot of one time inspections that
2 have to be done and we have commented in our letters to you
3 that you wanted to move those one time inspections as late
4 in the period as possible in order to assure that they will
5 catch any emerging degradation of materials on that. It
6 would be more troublesome if you were doing those one time
7 inspections very early in the process.

8 COMMISSIONER DICUS: Thank you, Mr. Chairman.

9 COMMISSIONER DIAZ: Yes, I appreciate your
10 discussion of the focus on the significant technical issues
11 and the process issues. I wanted to just make sure that we
12 understand what the differences are, and you have made a
13 clear case about scoping, which I think is directly related
14 to the technical component. And I just want to express the
15 fact that we are concerned that you put the resources, like
16 you very clearly said, on those areas that would be of most
17 value to the Commission, and that the small process issues
18 are not really something that even be decided in the first
19 go-around, that the staff will obviously be looking at each
20 step of the process, that the important thing the Commission
21 is to hear from you is what are the implications regarding
22 safety, because I am going to make George smile, you
23 obviously are going to be becoming a risk-informed license
24 renewal process. And by doing risk-informed license
25 renewal, you are going to focus on those things that are

1 more important to safety and, therefore, that will
2 eventually focus you into those areas. And we will be much
3 appreciative of the fact that you will be able to dedicate
4 the resources in the right areas.

5 DR. BONACA: I totally agree with you, and the
6 point I made is that, in fact, it is interesting that the
7 risk information was the ground excluded from the rule, and
8 yet it will come in just because the example I gave before,
9 because it will be licensees who will come in with changing
10 their licensing basis to be risk-informed, and that, by
11 definition, will force, on our part, the recognition that
12 that is the proper process. And it will give us some
13 additional confidence to the issue of completeness so as far
14 as identification of the components and adequacy.

15 COMMISSIONER DIAZ: So we might have to start
16 thinking of risk-informed as a more holistic rather than a
17 specific process.

18 DR. BONACA: That's right.

19 CHAIRMAN MESERVE: Ed, do you have any questions?

20 COMMISSIONER McGAFFIGAN: Yes, I do. Has any
21 member of the public attended any of your subcommittee or
22 full committee meetings with regard to Calvert Cliffs or
23 Ocone? Not the licensee, but, in particular, has the
24 National Whistle-blower Center been present for any of your
25 meetings, or raised any technical issues to you in looking

1 at the Calvert Cliffs application?

2 DR. BONACA: Not that I can remember. I can not
3 remember any.

4 COMMISSIONER McGAFFIGAN: I am going to now make a
5 statement more than ask a question. One of the things that
6 this group has been saying repeatedly is that we haven't
7 given them, afforded them an adequate opportunity to be
8 involved in license renewal. And to my knowledge, they
9 didn't attend scoping meetings for the Environmental Impact
10 Statement, they didn't attend the monthly meetings the staff
11 has with the licensee. They haven't attended your meetings.
12 And their interest in actually raising technical issues,
13 which there are numerous opportunities to do other than
14 through the formal hearing process, they also didn't last
15 year, in the five month period, ever come up with anything
16 close to a contention that would have any sort of standing
17 in our adjudicatory process.

18 I mean I take that their absence from involvement
19 in your process is yet another sign that they are not really
20 interested in dealing with technical issues. But that is
21 just me talking, that is not you. And I will pass.

22 DR. POWERS: Well, I can't speak to what their
23 interests are. I can speak to the process. We do have our
24 meetings, both subcommittee and committee meetings, recorded
25 in the Federal Register, announced, and we do afford people

1 the opportunity to speak or to submit written comments if
2 they are less comfortable speaking in our meetings.

3 COMMISSIONER McGAFFIGAN: I am well aware of that,
4 and I am well aware that people like David Lochbaum, on
5 other issues, he has been very -- they have had pretty
6 robust debates in your presence, and occasionally won.

7 DR. POWERS: Certainly, in the area of fire
8 protection we have had some useful information brought to
9 the committee by members of the public, and we have been
10 able to act on it, and staff has been able to respond to
11 that.

12 COMMISSIONER McGAFFIGAN: And as a general matter,
13 I am not putting words in your mouth, but you welcome that
14 information, the whole committee and all your subcommittees,
15 whether it is license renewal or fire, or Part 50 or
16 whatever.

17 DR. POWERS: Certainly, we have found the public
18 involvement very useful in bringing Watts Bar on line, where
19 we had groups coming to us bringing information about their
20 concerns, again, many of them connected with fire and we
21 were able to act upon those, and bring that I think to a
22 resolution they found satisfactory as well.

23 CHAIRMAN MESERVE: Commission Merrifield.

24 COMMISSIONER MERRIFIELD: Going back to your
25 slides, there is a couple of places where you mention

1 activities of ACRS involved in development of the license
2 renewal process, I am talking about the process issues,
3 focusing ACRS on significant technical and process issues.
4 In its recent budget cycle, the Commission I think came down
5 pretty clearly that we believe that the ACRS should be
6 focusing its resources, its limited resources on technical
7 matters and not be as concerned about getting involved in
8 some of these process matters.

9 Given all the technical issues that you have in
10 front of you, and you have done a tremendous job with many
11 of those that you have been called upon by the Commission to
12 look into, I am interested in knowing whether your
13 involvement in terms of some of these process matters, as
14 they relate to license renewals, may be taking away from
15 your time in other areas, important technical areas where
16 clearly the Commission is relying more heavily on your
17 expertise, rather than some of the process issues.

18 DR. BONACA: And I understand your concern. Let
19 me just say that regarding the process issues, we are
20 focusing on those which have really a technical
21 significance. For example, it is a process issue, the
22 scoping, and, yet, the adequacy of the set of components
23 which are within the license renewal, it is at the heart of
24 an inadequate management problem.

25 There has been too much debate on what has my

1 licensing been. The fundamental issue is, are we capturing
2 within this management of aging, all those components that
3 should be there? Other examples are one time inspection.
4 That seems to be a process issue, okay. And, yet, one time
5 inspections is also at the heart of some of the technical
6 issues. Is it adequate to just have one time inspection, or
7 do you have issues where you should have a more periodic
8 program in place? And those are some of the issues that the
9 staff has raised now.

10 So I contend, insofar as issues that have to do
11 with, first, are they out of date, or things of that kind,
12 we will not be involved in those. I mean we will we just --
13 we are mostly looking -- and I used the word "process" a
14 number of times here mostly because I was looking at the
15 evolution of the SRP and the review plan and its completion
16 in 2001 as part of the process, but in reality, we are
17 looking at technical issues.

18 COMMISSIONER MERRIFIELD: Okay. So you recognize
19 the directions that the Commission has gone in that regard
20 and are being -- you believe you are being appropriately
21 disciplined in your manner.

22 DR. BONACA: Yes. If there is no significance to
23 the technical content, we will not look at that.

24 COMMISSIONER MERRIFIELD: Okay. Thank you very
25 much.

1 DR. POWERS: If something came in, the committee
2 could offer any real assistance on process issues when they
3 are pure, the technical interface between process and
4 science is an area we sometimes have to tread, and the one
5 time inspection is probably the most noticeable of those.

6 COMMISSIONER MERRIFIELD: No clues. Issues aren't
7 -- it is not easy to make a finding, I recognize that. I
8 just wanted to make sure that it was clear where you are
9 coming from. Thank you.

10 CHAIRMAN MESERVE: Let me ask a question about
11 really the ultimate take-away message that we should get
12 from this presentation. Have I correctly perceived that you
13 are comfortable that the safety issues associated with
14 relicensing are being appropriately addressed and resolved?

15 DR. POWERS: I think the take-home lesson is
16 twofold. One is the staff, indeed, is doing a good job.
17 The licensees, indeed, are doing a good job in preparing the
18 applications and in inspecting them and preparing the SERs.
19 That we can have confidence in many of these things, and we
20 can define from that the things that we should focus on for
21 our work.

22 The next thing is that we are using these
23 experiences for these two pilot plants to try to design a
24 steady state process that we can use in the future as other
25 licensees come along. And I think those are the two

1 important issues to come out of this.

2 CHAIRMAN MESERVE: Any other questions?

3 COMMISSIONER DICUS: No. Thank you.

4 CHAIRMAN MESERVE: Why don't we proceed.

5 DR. POWERS: I want to move now to the next area
6 of focus for the committee, and that is risk-informing the
7 10 CFR Part 50. I think you are aware that the Advisory
8 Committee on Reactor Safeguards has a long history of
9 encouraging the use of quantitative risk analysis in the
10 licensing process, and so we are particularly excited that
11 this Commission has made it a priority and has been
12 encouraging the staff to go in this direction and given them
13 a charter to work on this process.

14 This is an area that we want to work very closely
15 with the staff on. We are very concerned about the
16 technical capabilities that the staff has to have a
17 risk-informed Part 50. With that, I will turn to our
18 award-winning Vice Chairman to discuss some of the details
19 of the process that we will have to follow to make 10 CFR
20 Part 50 risk-informed.

21 DR. APOSTOLAKIS: Thank you, Mr. Chairman. I will
22 have to return the award to avoid these comments in the
23 future.

24 Good morning. The Part 50, risk-informing Part
25 50, we had a very good meeting with the staff at the last

1 ACRS meeting, and we issued a letter. And essentially we do
2 agree with the staff's approach, -- this is the second, I am
3 not using my first one -- to issue a new regulatory section
4 10 CFR 50.69 and Appendix T. We agreed that preserving the
5 current terminology of safety-related and non-safety-related
6 SSCs is something that must be done, but then developing
7 additional classification based on risk information is what
8 will make it risk-informed.

9 We wrote a long series of comments on importance
10 measures, and the purpose here is not to bring up detailed
11 technical comments to the Commission, the idea is to
12 sensitize you to the fact that these measures play a
13 significant role in many of the new risk-informed Regulatory
14 Guides. They are used extensively in the graded quality
15 assurance programs, inservice inspection, and they appear to
16 be central to the so-called Option 2 of risk-informing Part
17 50.

18 And it is the view of the committee that these
19 importance measures have not received the scrutiny they
20 deserve. It is not just a matter of a little mathematical
21 detail here and there. I think all of us, both licensees
22 and regulators, have to understand what information these
23 measures convey and what the limitations are. And there are
24 some funny things that happened. You know, unless you
25 really look carefully, you don't realize, for example, that

1 just because somebody did a poor job, say, a conservative
2 estimate of the contribution to risk from tornadoes, that
3 may upset the risk ranking of the SSCs for internal events,
4 for example, or, you know, for the whole PRA, just because
5 that fellow was very conservative, because if we are taking
6 all the contributions and using them in these measures.

7 And one point is set out and everybody said, yeah,
8 sure that makes sense, but the question is, do the expert
9 panels, when they make their evaluations, know this? Are
10 they full aware of it? Are they fully aware of the fact
11 that when you want to assume one component down, you are
12 affecting several terms in the PRA, not just one? Are they
13 aware of it? I mean if they are and they take that into
14 their deliberations, then I think we are closer to a
15 rational ranking of SSCs than we would be otherwise.

16 So even though there are details here, I really
17 don't want to get into that unless the Commission feels we
18 should discuss it in more detail.

19 But now I want to raise another issue which I
20 think is broader. Well, there is also a last bullet in the
21 previous slide that we really have to resolve certain policy
22 issues, especially those regarding defense-in-depth before
23 we proceed with Option 3, because the staff told us that
24 defense-in-depth considerations will play a role in
25 selecting individual regulations to risk-inform. And we

1 will have a discussion, of course, on defense-in-depth a
2 little later with Dr. Kress leading it.

3 Now, there is another issue. I believe that the
4 way the Regulatory Guides are written for risk-informing the
5 regulations is, in fact, discouraging the use of risk
6 assessment. And I have two examples that just happened to
7 be in my mail two days ago. One is dealing with Draft Guide
8 1082 and the maintenance rule, and the other one is NEI
9 96-07 on 50.59. They both take pains to make it clear that
10 one does not have to have a risk assessment, a quantitative
11 risk assessment to implement these things.

12 And then they go on and, they say, now, if you use
13 risk assessment, here is what you have to do, and there are
14 all sorts of requirements. You have to show in 50.59 that
15 the probability of malfunction is not increased by more than
16 a factor of 2. You have to comply with a whole section in
17 DG 1082 on the risk significant configurations, that gives
18 you detailed guidance, 5 times 10 to the minus 8 for LERF
19 and this and that, and there is no equivalent guidance for
20 the so-called traditional approach, deterministic approach.

21 So if you sit back and think about it, you will
22 have to reach the conclusion that you are asking for trouble
23 if you quantify risk and come before the Commission, because
24 then you get all sorts of questions about your completeness
25 of your PRA, the quality of your PRA. You have prove that

1 the probability is not greater than a factor of 2. If you
2 do it the other way, you don't get any of that. You are
3 just, you know, doing a few things. You are argue for a
4 while and then everything is fine.

5 So why should you use quantitative risk
6 information in a risk-informed regulatory system? Right
7 now, I would not use it. If I go with the guides, I would
8 not use it, and I think that is something that is very
9 important. In my view, if a licensee takes the time to do a
10 good job with the PRA and produces a quality PRA, that
11 licensee should have an easier time with the Commission when
12 it comes before the Commission requesting something because
13 more information is being used, not because PRA is better
14 and so on. There is more information in the analysis. You
15 are using more failure rates, historical records. You look
16 at the plant as a total system, you know, socioeconomic --
17 socio-technical system, so you should get some credit for
18 that, not be penalized and get all sorts of questions about
19 the quality of your analysis. That is one.

20 The second one, that leads me into 50.59, unless
21 you want to say something before we go.

22 DR. POWERS: If you want to progress on directly
23 to 50.59, I think it is close enough.

24 DR. APOSTOLAKIS: It is close enough, yeah. If
25 you look at 50.59, again, well, this is, of course, a very

1 important rule, something that is being used every day. And
2 the new version of it is not risk-informed. We are talking
3 about minimal changes and so on. And, by the way, the same
4 comments apply to this NEI 96-07, the comments I just gave
5 you, that a licensee who uses PRA is really penalized.

6 But there is a bigger issue here. Well, before I
7 go to the bigger issue, we were pleased with a presentation
8 by the staff about a year ago when they were working on
9 risk-informing 50.59, then that was stopped because we are
10 looking at the bigger picture now, Part 50. But we feel
11 that 50.59 should have a special place in these activities,
12 and the effort there should be expedited.

13 Then we sit back again and think about what we are
14 doing. So what do we see? Well, we can have the IPES that
15 have been completed now. And I understand the finding was
16 that 19 units have core damage frequencies above the
17 Commission's stated safety goal for core damage frequency --
18 well, actually, it is not the Commission's, 10 to the minus
19 4 per reactor year.

20 And some of us on the committee feel that because
21 the PRAs are incomplete and the IPES were not really done,
22 all of them, to the best of standards, maybe the number of
23 units with higher core damage frequency is higher than 19,
24 and the Commission has decided to do nothing about it
25 because these units have been licensed and they are

1 operating, we can't do anything. I mean the number is not
2 very high so that bells start ringing. So you say, okay,
3 that is fine to have a unit with 5 10 to the minus -- to
4 have a unit with core damage frequency of 5 10 to the minus
5 4 maybe is not that bad. They satisfy all the NRC
6 requirements, so there is a presumption of adequate
7 protection.

8 And then you go to 50.59. And what do we see
9 there? We are spending all this effort, all this time
10 worrying about a little valve someplace, whether its
11 probability of malfunction, and that valve may be irrelevant
12 to the whole plant, has been changed by more than a factor
13 of 2. We look at possible initiating events and we worry
14 and argue whether minimal means 10 percent change or it
15 doesn't mean 10 percent change, and we worry about that.

16 So, here we are on the one hand tolerating core
17 damage frequency greater than 10 to the minus 4 per reactor
18 year, and on the other hand spending all these resources
19 worrying about little components here and there, whether it
20 was painted with the right paint or somebody's title was
21 changed from vice president to manager. Why? Somebody has
22 to look at the big picture and say that is not the way to
23 risk-inform the regulations. And we think a bold approach
24 to 50.59 is required here.

25 For example, we already have 1.174, you know, the

1 jewel of the crown, and it says 10 to the minus -- delta CDF
2 of 10 to the minus 5 is okay. Why can't we say that the
3 delta CDF of 10 to the minus 6 is something the Commission
4 will not care about? Let them do everything they want as
5 long as delta CDF is less than a very small number. If I
6 tolerate a plant having 10 to the minus 4 core damage
7 frequency, why should I care whether they make some change
8 that affects that, you know, one-hundredth of it?

9 Now, this is the overall approach, of course.
10 There may be details that have to be worked out. What if
11 the core damage frequency of a good plant is already 10 to
12 the minus 6, would you want it to be doubled without review?
13 Okay, these are details. But it seems to me that there is
14 an inconsistency between various pieces of regulation, which
15 I am sure comes as a surprise to the Commission, and we have
16 to think about it very hard. Risk-informing a piece of
17 regulation does not necessarily mean looking at its scope
18 and trying to inject risk information. Maybe we should
19 revisit the whole intent of that regulation. And I think if
20 we do, that 50.59 will not survive as we know it.

21 I am open to questions, if there are any. I can't
22 imagine why.

23 CHAIRMAN MESERVE: George, let me ask you a
24 question about the first point you raised about the various
25 important measures. As I understand it, they are sort of

1 being developed. You have raised some questions I think
2 that raise fundamental issues about the adequacy of the
3 measures that are being evaluated. Do you have suggestions
4 or has ACRS been thinking of suggestions for alternatives?
5 Where are you headed on this?

6 DR. APOSTOLAKIS: I do have some ideas and I am
7 not sure that the ACRS is the appropriate body to do this.
8 And I don't think that it is difficult to come up with more
9 robust measures within a reasonable amount of time. For
10 example, again, without getting too technical, our
11 colleagues on the other side, waste disposal, if you look at
12 the performance assessments and the kinds of statistical
13 work that these guys have done after they get the outputs
14 from these huge codes they have, this is very sophisticated
15 stuff.

16 And there is a lot of -- there are a lot of good
17 ideas there that one can borrow and develop good measures
18 for the reactor side. The big difference is that we are
19 dealing with yes/no events most of the time, Boolean type
20 things, and they are dealing with physical phenomena,
21 chemical phenomena, so they have coupled codes and all that.
22 But the ideas are there.

23 So I don't think we should turn PRAs into
24 something that would be as complex as what those fellows are
25 doing. But I think the ideas are there. In other words, we

1 are not asking for something revolutionary here. I don't
2 think that anyone -- I mean these measures, as far as I
3 know, were developed not really as a major -- they were not
4 the result of a major research effort. Years ago, and then
5 slowly people realized that, you know, they are very useful.
6 The idea is very useful. So now they are becoming so
7 important that I think it is time we went back and
8 questioned their derivation and see whether we can do
9 better. But it is not just a little detail, that is why we
10 bring it up to this level, but it is really a critical
11 issue. But it can be resolved in a few months, in my
12 opinion, by somebody who really understands the issues and
13 so on.

14 CHAIRMAN MESERVE: You made the point about the
15 guides being highly prescriptive when you happen to use a
16 PRA and not otherwise, and you interpret that to mean that
17 discourages the use of PRAs.

18 DR. APOSTOLAKIS: Yes.

19 CHAIRMAN MESERVE: And isn't it, in fact, likely
20 that the prescription gives you certainly in that you know
21 what steps you have to go through, and if you follow the
22 steps, then you know how you are going to end up? It
23 facilitate the staff review in a way that the vaguer
24 alternative would not. I mean isn't the answer to this
25 going to be in how this actually works out in real cases as

1 to whether it discourages PRAs or not?

2 DR. APOSTOLAKIS: I fully agree that it helps the
3 review, but it is really one-sided. If I am told that I can
4 go either way, A or B, and for way A, oh, you know, do it,
5 and B, I see all sorts of prescriptives requirements, then
6 right there I may want to rethink whether I want to go this
7 way. If I decide to go the PRA way, then, yes, having all
8 these statements here helps, because it tells me what is
9 expected of me. But I am talking about the decision of
10 whether to use PRA. So all I have here is one sentence,
11 these assessments do not necessarily require that the
12 quantitative assessment of probabilistic risk be informed.
13 So I can do it, you know.

14 Why don't you give me then an equal amount of
15 prescriptive details if I decide not to use a quantitative
16 assessment of risk? It sort of relies on the fact that,
17 yeah, we all know what the traditional way of doing business
18 is. But I would like to know, what is the requirement in
19 the traditional or regulatory way that is equivalent to
20 having a core damage probability of 5×10^{-7} , for
21 example? Why should I have the burden to prove this is I
22 use PRA, and the other guy who doesn't use a PRA doesn't
23 have anything similar to do? In that sense it discourages
24 me from using PRA.

25 CHAIRMAN MESERVE: Any other questions?

1 COMMISSIONER DICUS: Yes, let me ask a couple of
2 questions with regard to risk-informing Part 50. One of
3 them has to do with research and the other one has to do
4 with research and our new reactor oversight process. The
5 first one with regard to research. Could you give me some
6 idea of what areas of research will be the most supportive
7 or risk-informing Part 50?

8 DR. APOSTOLAKIS: I think --

9 COMMISSIONER DICUS: Dana is smiling.

10 DR. APOSTOLAKIS: I will preempt you.

11 DR. POWERS: I was going to get preempted no
12 matter what.

13 DR. APOSTOLAKIS: I believe the major issue --
14 well, besides, you know, the importance measures which is
15 something in my view is important, but not something
16 requiring a major effort. I think when you see PRA
17 mentioned in any of the documents, immediately the issue of
18 completeness comes up, and quality, of course. And when we
19 talk about completeness, we usually talk about low power and
20 shutdown modes, that there were some activities -- well,
21 significant efforts, in fact, by two national laboratories a
22 number of years back, but they were not complete in the
23 sense that the internal event PRA is. At the same time
24 other people feel that maybe the hazards are not as high
25 during that time, so we have to settle that at some point.

1 So I think that is one area where we certainly need to do
2 something about it.

3 People are talking about human performance, for
4 example, and the focus is on the control room people during
5 an accident. And it occurs to me that we have had several
6 incidents the last several years that had nothing to do with
7 accidents, the humans actually started something. So, I am
8 not sure we really understand that. And I am not talking
9 again about forgetting to close a valve after a test, we
10 know that. But, for example, if you take incidents like
11 Wolf Creek and so on, where they moved certain activities
12 from Friday to Monday, and they were done in parallel in
13 other activities, created a path, we lost about 9,000
14 gallons of water, I understand. These kinds of things.

15 Now, human performance, again, you know, if you
16 look at the community of people who worry about these
17 things, the issue of safety culture is everywhere, and yet
18 we are doing nothing about that. I am not saying that
19 safety culture is something that is critical and we should
20 rush and do something about it. All I am saying is, do we
21 really understand what the possible impact of that is?
22 Which parts of safety culture can we legitimately regulate?
23 Because we certainly don't want to start running the plants
24 for the utilities. But to say in a blanket way, don't look
25 into this seems to me to be an extreme position, too.

1 Especially, you know, in other countries, they are looking
2 into this and, you know, smart people are saying that this
3 is important. And, as you know, the INSAC group of the
4 IEAEA has published a series of reports and so on.

5 So, in general, I would attack the issues of
6 completeness and see whether there we can do something, so
7 people will not say automatically, yeah, these things are
8 not done well or they are not there.

9 DR. POWERS: I would just add to Dr. Apostolakis's
10 point to say that I think, yes, we need to have a standard
11 for the PRA that we can do now, one everyone agrees that if
12 you live up to this standard you have an adequate assessment
13 that can be relied upon to draw conclusions from, even if
14 that does not extent to all of the modes of operations that
15 the regulations cover and only addresses some portion of it.
16 You still have this need to have something that as a
17 technical community we can all agree that a PRA done this
18 way is acceptable detail, acceptable accuracy to regulatory
19 conclusions from.

20 I think that is clear that we need that before we
21 can move to risk informed regulations pandemically.

22 DR. KRESS: May I also chime in on my favorite
23 subject? That is uncertainties. The PRAs we have out there
24 don't really address the uncertainties very well in my
25 opinion. The only good uncertainty analysis we have is in

1 NUREG-1150, but it is not plant-specific and it is very
2 difficult to draw conclusions about specific plants, and the
3 uncertainty and the assessed value of the risk from 1150.

4 In my opinion while we move into a risk informed
5 world, the only way we can deal with the bottom lines, which
6 I think we are going to have to -- the bottom lines of the
7 importance measures as well as CDF and LERF is to have
8 associated with it a proper uncertainty analysis and to do
9 that on a routine, regular basis, or plant-specific basis I
10 think needs a little more research and a little more effort
11 to figure out how to do that appropriately if you are going
12 to get both epistemic and aleatory uncertainties in the PRA
13 on a plant-specific basis.

14 COMMISSIONER DICUS: Okay, thank you. If I could
15 put one more quick question, the other one having to do with
16 risk, and our new oversight program. Do you think that risk
17 has been appropriately addressed in the performance
18 indicators for a new reactor oversight program? Oh, dear.

19 DR. APOSTOLAKIS: I remember we had some questions
20 about that but then we stopped reviewing the effort. I
21 don't know what they are doing now.

22 DR. POWERS: I think we can reiterate concerns we
23 had about where they would select the standards and is it
24 correct to have a generic standard or should it be a
25 plant-specific standard and should that be a time evolving

1 standard that is, as the industry average improves, are you
2 asking for more and more rigorous safety from the plant --
3 from a particular plant.

4 Those were two questions that we raised and we
5 certainly felt that it was a plant-specific threshold that
6 was going to be needed in the future. The Staff has
7 responded to us saying, well, we agree in principle but we
8 have chosen things that in fact will have sufficient
9 flexibility to them that they will allow plants with
10 peculiarities to be treated -- and I think at that point we
11 left that issue and we have not come back to it and had no
12 plans of coming back to it following --

13 COMMISSIONER DICUS: So you consider it a still
14 in-the-air issue?

15 DR. APOSTOLAKIS: Surely. In fact, I think it is
16 plain wrong to use generic criteria. It is wrong. It
17 should not be done, yes.

18 COMMISSIONER DICUS: It should be plant-specific.

19 DR. APOSTOLAKIS: It should be plant-specific, and
20 thank you very much for reminding me of it.

21 If the Staff has really thought about it, then
22 they have not done a good job communicating it to us. I can
23 only go by the report. If I monitor something I have to
24 allow for those random variations, you know, in quality
25 control for example -- you know, you test 10 items.

1 Sometimes you find one defective but next time none, so this
2 random variability has to be accounted for. You can't work
3 only with frequencies and I haven't seen a good discussion
4 of how this will be accounted for and I think the reason is
5 again because they don't start with the plant-specific
6 performance indicators.

7 The other thing that was not clear to me was
8 exactly what the performance indicators covered and why did
9 you need the basic -- baseline risk inspection. It is
10 mentioned that the baseline inspection supplements the
11 performance indicators but the case was not done
12 convincingly in my view. Again, that was a draft report. I
13 am willing to accept that people have made progress.

14 MR. BARTON: I think, George, we also questioned
15 the thresholds of the performance indicators.

16 DR. APOSTOLAKIS: Yes.

17 COMMISSIONER DICUS: Thresholds, yes. I am aware
18 of that.

19 DR. APOSTOLAKIS: And the last point was the
20 decision-making process. If you have two reds and one green
21 or two whites and three greens, how do you decide in a
22 rational way, what is the reasoning behind it that leads you
23 to certain action? That matrix at the very end? In some
24 instances actually it is very nice.

25 It is very good. It says, you know, in some

1 instances the licensee will have to propose a program and
2 all we are doing is monitoring it. In other cases the Staff
3 takes over and says we are going to do this and then in some
4 serious cases of course it may come up all the way to the
5 Commission. But what is the logic behind this?

6 If I look at various colors, how is the decision
7 made, or is it just a matter of judgment -- to say, you
8 know, this makes sense and that's about it.

9 COMMISSIONER DICUS: Mr. Chairman, I am taking up
10 more than my fair share of time. I recognize just one quick
11 follow-up on that and then I'll be quiet for the rest of the
12 day maybe --

13 [Laughter.]

14 COMMISSIONER DICUS: The pilot projects, the pilot
15 plants that we are doing answer the questions, the issues
16 you have just surfaced, give us better, give the Staff a
17 better feel for this or not?

18 DR. APOSTOLAKIS: Well, this is another point
19 where we have frequently disagreed with the Staff. We are
20 of the view that before one goes to run pilot programs one
21 has to define what are the objectives of the pilot programs,
22 what questions we will be asking and how we are going to try
23 to get the answers to those.

24 Unfortunately, this does not happen. Maybe that
25 is a very academic view of the world. In real life the

1 Staff has explained to us that, you know, they don't really
2 pick and choose. The licensee has to volunteer. Sometimes
3 the timing is not controlled and so on, so sometimes in fact
4 the pilots have started before we even have the theoretical,
5 so to speak, background, and that I think happened with
6 1.174, creating all sorts of unhappiness because the
7 utilities did not get the response because we didn't have a
8 response. We didn't know what to do.

9 So I am not sure they will get the answers. I
10 don't know. I don't know because these questions at least
11 to our knowledge were not posed in advance. Now maybe they
12 were posed, you know, when they started the pilots but we
13 have not seen them.

14 DR. POWERS: We have raised questions with the
15 Staff about these pilots, both the basis for designing the
16 pilots, that is, and how you use them, but also the
17 duration, and I think we still remain puzzled about how we
18 can hope to get an understanding from the pilots that don't
19 run through a full, complete fuel cycle.

20 The Staff has responded to us on that. They are
21 really not looking I think for answers to those kinds of
22 questions from the pilots. I think they are looking for
23 more process type difficulties than they are the theoretical
24 understanding of the -- what is being piloted here, and I
25 think that is something that we have to wrestle with in

1 looking at the results of the pilot studies and then
2 thinking what additional pilot studies will be done for
3 other rules.

4 Are we looking for just a process, the mechanics
5 of carrying the thing out, or are we really looking for data
6 and information on whether it is the right approach to use?

7 COMMISSIONER DICUS: Thank you, Mr. Chairman.

8 CHAIRMAN MESERVE: Commissioner Diaz.

9 COMMISSIONER DIAZ: Let's see. I am almost
10 hesitant to do what I am going to vow to do, which is to try
11 to summarize in a couple of minutes what Apostolakis was
12 implying and I am not concerned about being wrong. I am
13 also, you know, almost more concerned about being right,
14 about what he said, because as I was listening to you I got
15 the sense that you are really asking with your technical
16 statements a policy issue regarding what is the state of
17 affairs of risk informed regulation and how this applies
18 across the board.

19 In other words, are we really establishing
20 multiple regulatory regimes that are actually trying to go
21 from a pure deterministic to almost a pure, you know, call
22 it risk informed or risk-based and what tools do we use to
23 define where are our licensees in that -- let's call it a
24 continuum if you want to.

25 Do we have the appropriate tools to determine what

1 that is?

2 Let me go a little further on this, because the
3 question is in -- something just occurred to me. Somebody
4 could ask are you pregnant? Are you a little big pregnant
5 or are you fully pregnant? And the reply to that in
6 regulatory terms is, you know, is of serious concern.

7 If we do not provide a clear differentiation for
8 whether the licensee's operations and the regulations that
9 apply to them are a combination of risk-informed and
10 deterministic to what extent, where can people use different
11 tools that are available both in their plants and for
12 matching regulations, where are they? And there are
13 boundary conditions that are established. Some of them I
14 would say would have to be voluntary and not mandatory for
15 some things. We have also comments -- we cannot do
16 risk-based; we have to be risk-informed, but it appears to
17 me that we are getting into grounds in which definition of
18 what regulatory regime applies and what we are licensing
19 needs to have further definition.

20 I remember one time, you know, some time ago
21 before this pilot started somebody came and said it should
22 not be high risk significant or low risk significant, it
23 should be a continuum, it always should be, and my point was
24 that our regulations really have a hard time dealing with
25 that case, that we need to partition it into, you know, I

1 kind of like what South Texas says -- you know, four bins
2 because we can deal with bins. It is very difficult in the
3 state-of-the-art to deal with a continuum because then you
4 are always judging where you are.

5 So are you saying, Dr. Apostolakis, that because
6 we are coming with sets of risk informed tools and
7 regulations that there is not sufficient definition to the
8 term and what regulatory regime do we need to apply and if
9 so what will be the ACRS recommendations?

10 Maybe you cannot do it today, but will that be
11 something the ACRS needs to look at?

12 DR. APOSTOLAKIS: Yes. I really did not address
13 that question. Maybe I did not express it -- expressed it
14 incorrectly.

15 I do agree with you, I think with everything you
16 said, but it has to be a combination of deterministic --
17 let's not call it deterministic -- traditional, archaic
18 approaches.

19 [Laughter.]

20 DR. APOSTOLAKIS: And the progressive --

21 MR. BARTON: That's biased.

22 COMMISSIONER DIAZ: That seems to be a bias.

23 DR. APOSTOLAKIS: Something about classical -- the
24 traditional approaches and PRA. Yes, there has to be a
25 combination. It is not just a pure -- I mean it is not risk

1 based. There is no question about it, and I am not sure
2 that we really need to define boundaries. I mean the
3 analysis should be good.

4 On the other hand, from the formal, the legal
5 point of view, I think we have said that 1.174 and all other
6 guides are voluntary, right? So one can come here without
7 any risk information and I would like to know how well they
8 will do, by the way. I am not sure they will get away with
9 it, but anyway --

10 COMMISSIONER DIAZ: There is voluntary and there
11 is voluntary.

12 DR. APOSTOLAKIS: I understand that -- with a
13 capital "V" and a lower case "v" --

14 MR. BARTON: Special circumstances also.

15 DR. APOSTOLAKIS: That's right. So that is a
16 different issue. What I said was that the way we are
17 writing these document, these Regulatory Guides, and I did
18 not want to imply this was done maliciously, by the way -- I
19 did not want to imply it was done intentionally, but in the
20 attempt, the effort to show that really PRA is not the only
21 tool, I think we have gone all the way to the other extreme
22 and we are giving all these prescriptions about the PRA part
23 and almost nothing about the other route, and it seems to me
24 that if I were a licensee and I had to make a decision which
25 way to go I would be discouraged by this.

1 I will hear about all these debates about the ASME
2 standard and the people don't like it and quality of PRA.
3 Why would I get into this?

4 COMMISSIONER DIAZ: I understand what you said. I
5 think -- exactly. I was trying to extrapolate to what will
6 the Commission have to consider as a policy issue in regards
7 of determining how far to go into establishing pathways that
8 are more risk informed, medium risk informed, and how are we
9 going to be able to regulate them? How will the licensee be
10 able to say I am in this regime and how do I get regulated,
11 because that will determine what the quality of the PRAs
12 have to be.

13 DR. APOSTOLAKIS: Yes. Sure.

14 COMMISSIONER DIAZ: That will determine how the
15 Staff will deal with it. That is really the --

16 DR. APOSTOLAKIS: As Commissioner Merrifield
17 reminded us earlier, we are not supposed to talk about
18 policy issues, but I am talking about the technical path
19 now.

20 COMMISSIONER DIAZ: Technical basis.

21 DR. APOSTOLAKIS: Right. It seems to me that the
22 guiding principle here should be that if a licensee chooses
23 to use risk information the review process by the Staff
24 should be easier and faster. It should be more difficult to
25 do it without risk information. Then there is a benefit.

1 Then people will say, gee, I get something in return --
2 maybe, yes, I will have to show that my analysis is of high
3 quality and so on, but look what I get back -- quick
4 response and this and that.

5 Right now I don't think these documents do that.

6 COMMISSIONER DIAZ: Thank you.

7 COMMISSIONER McGAFFIGAN: I could go on for awhile
8 too. Let me first ask, on 50.59 our goal -- I think it is
9 yours -- has to bring some stability back to that rule as it
10 is used in the deterministic framework, get rid of the
11 connotation that any means zero to large numbers of decimal
12 places, et cetera, so the goal was to bring stability.

13 I think the rule does that. The Reg Guide -- you
14 know more about it than I do, the NEI 9607, but if they have
15 retained the "so small" standard that was in their previous
16 Reg Guide, 9607, Rev. zero or one, whatever it was, and they
17 have using that, then I don't have a problem with it.

18 If they have also added if you are going to go
19 down and try to make of this "minimal" -- I mean we went to
20 minimal, which is meant to be above "negligible,"
21 whatever --

22 [Laughter.]

23 COMMISSIONER McGAFFIGAN: And all this has been
24 laid out in numerous SRMs, but if you are going to use that
25 flexibility, which may be more flexibility on the so small

1 standard, then here is what you might have to do.

2 The other thing that pervades your documents is
3 quality of PRA issues, the scope of PRA issues, et cetera,
4 so I mean our goal is to finish that Reg Guide reasonably
5 promptly so that people -- so there is stability back in the
6 industry in using 50.59.

7 Now if we are going to some day risk inform it,
8 then maybe a lot of these considerations come in but I
9 think, like I say -- I know nothing about the current status
10 of 9607 -- but if what they are saying is if you are going
11 to try to work on the edge of minimal, whatever minimal
12 means, then you have to be -- then you probably should be
13 into the risk informed framework and you should be using
14 delta CDFs and you should be thinking about -- I didn't
15 realize we had said five times to the minus seven. I
16 remember once we were using --

17 DR. APOSTOLAKIS: No, that was maintenance rule.

18 COMMISSIONER MCGAFFIGAN: But it strikes me that
19 we are trying to get stability there and risk informing it,
20 if it ever happens, is something down the road.

21 DR. APOSTOLAKIS: Yes. My comments were not
22 intended to criticize the existing document and the effort
23 to make it, to bring stability. My comments had to do with
24 risk informing 50.59. I am looking for the future, in other
25 words --

1 COMMISSIONER MCGAFFIGAN: I work on a good enough
2 standard today and --

3 DR. APOSTOLAKIS: Well, it seems to me though that
4 again here is a good example of what we were talking about
5 with Commissioner Diaz. If someone decides to go the PRA
6 route, and that someone gets a criterion from the Commission
7 that as long as delta CDF is less than a number in delta
8 LERF go ahead and do anything you want, now that is a clear
9 case you are going the risk informed way is beneficial. I
10 can do much more now than I can do with the existing
11 process, which worried about the little valve and the little
12 pipe and this and that.

13 See, then the licensees will have great incentives
14 to really go that way.

15 COMMISSIONER MCGAFFIGAN: My sense is -- I mean my
16 sense is given what I know of Reg Guide 1.174 with its 10 to
17 the minus 6 and 10 to the minus 5 thresholds that you indeed
18 may well be -- you know, that the Staff may be trying to
19 build in something about so small or NEI may be -- I am not
20 sure whose document we are looking at -- where they can get
21 to significant levels if they use PRA, but if you use PRA,
22 given all these quality issues, here's some prescriptiveness
23 that you have to follow in order to get to a CDF number that
24 is low enough that you don't have to submit a license
25 amendment because when we talked about 1.174 even if they

1 calculate it is less than 10 to the minus 6 CDF they have to
2 come in with a license amendment.

3 COMMISSIONER DICUS: Right.

4 DR. APOSTOLAKIS: That's right. It will have to
5 be changed.

6 COMMISSIONER MCGAFFIGAN: And that is going to
7 have to be changed?

8 DR. APOSTOLAKIS: Yes. Yes. That is correct.

9 COMMISSIONER MCGAFFIGAN: Why don't I just leave
10 it at that. I could go on for awhile, but I just urge you
11 guys to think about, you know, let's take these things step
12 by step rather than, you know, load everything that you hope
13 for the future onto the present.

14 CHAIRMAN MESERVE: Commissioner Merrifield.

15 COMMISSIONER MERRIFIELD: Let me ask a few quick
16 questions, going back to your slide relative to
17 risk-informed 10 CFR Part 50. We have just received
18 SECY-99-265, the rulemaking for risk-informing special
19 treatment requirements, which I have to admit I have not had
20 an opportunity to review yet. And I just want to get to
21 sort of a bottom line. Do you believe that the staff's
22 rulemaking plan is a sound one?

23 DR. APOSTOLAKIS: This SECY is the one we
24 reviewed. I don't remember the number. Is it the one we
25 reviewed? But we reviewed the document, yeah, and we agree,

1 yes. Yes, it is essentially sound, except for this issue of
2 importance measures, which is really broader.

3 COMMISSIONER MERRIFIELD: Okay. The second thing
4 I want to mention, obviously, you know, the staff has been
5 working on the 50.59 issue and on the Reg. Guide. I know
6 they have made comments to me about the degree to which ACRS
7 has engaged in this effort and they feel that you all have
8 been very accommodating to their very aggressive schedule
9 for this. So I guess what I want to say was, you know, they
10 have been saying good things about you and you ought to know
11 that. But given --

12 DR. POWERS: We say good things about them, too.

13 COMMISSIONER MERRIFIELD: But given the fact that
14 are going to be probably submitting that guide to ACRS in
15 the next few weeks, and you are not going to be having --
16 you don't have a January meeting, I am hoping that you may,
17 although you may not have as much time with it as you would
18 like, that you can be accommodating to the schedule to make
19 sure that we continue this in straightforward manner to keep
20 it going.

21 DR. POWERS: Sure. Sure. The ACRS has written
22 frequently that it is very important that we have a stable
23 50.59 that can be used, because it is an everyday kind of
24 workman regulation and it is important to have it available
25 to the licensees and to the NRC. We do also think that

1 having established a stable 50.59, that the next step is to
2 try to have a risk-informed 50.59. And it is our feeling
3 that that one is a doable thing. The current technology is
4 sufficient to support a risk-informed 50.59 consistent with
5 what we have done in Reg. Guide 1.174 for risk-informed
6 changes to the current licensing basis.

7 But the ability to do that risk-informed version
8 ought not have any impact on getting a stable 50.59 at the
9 plants immediately.

10 COMMISSIONER MERRIFIELD: Okay. The next thing I
11 just wanted to mention, you know, you have discussed the
12 whole issue with risk-informing Part 50, the fact that the
13 staff is, you know, sort of going through this one by one
14 and saying, how do we risk-inform this piece? You seem to
15 suggest that we ought to step back and look at some of these
16 individual pieces and say, you know, if it doesn't meet a 10
17 to the minus 6, we ought to get out of the way.

18 How difficult technically is that going to be for
19 the staff, for us to do that overall kind of review? Do you
20 think that is a relatively simple process to think about
21 doing, or is one which would require significant resources?

22 DR. APOSTOLAKIS: You mean to look at the global
23 picture?

24 COMMISSIONER MERRIFIELD: Yes.

25 DR. APOSTOLAKIS: I don't think it will require

1 significant resources. I mean in developing 1.174, the
2 staff developed a set of principles for risk-informing the
3 regulations, or, you know, the requests for changes in the
4 licensing basis. So I guess something similar here,
5 although I wouldn't really call it principle, or you could
6 say that there should be a principle that we should be
7 consistent, I mean that is a nice principle to have, and
8 make sure that the scope of what we are doing here is not
9 too inconsistent with the scope of what we are doing there.

10 So I don't think that is a major issue, and I
11 think the staff are very experienced. They can do this,
12 given the opportunity. You know, if they have to really
13 produce something, an Option 2, and it is due next month,
14 then, of course, people don't sit back and reflect on these
15 things. But if you give them the time to reflect on it, I
16 don't even think it will take more than three months,
17 frankly.

18 COMMISSIONER MERRIFIELD: One last thing I want to
19 ask about, you described the road taken and the road not
20 taken, and the fact that licensees are not engaged in the
21 PRA as much as they should be because of perhaps some of the
22 structures that we put on top of it. Obviously, we as a
23 Commission have committed significant resources to try to
24 encourage people to become more risk-informed and to use
25 that PRA analysis.

1 I haven't -- I have had discussions with a variety
2 of licensees recently. That issue has not been raised to
3 me, not to say it is not there. It does concern me, I mean
4 if it is true, assuming arguendo what we are saying is
5 correct, it disturbs me that we are putting so much of an
6 effort on the part of this Commission into that process and
7 people aren't choosing to take it. And so, if there are,
8 you know, when you have got some additional information you
9 can share with the staff about specific examples where that
10 road not taken has occurred, or I would also encourage the
11 licensees who have made that decision on their own, to share
12 that with us, because that is obviously -- if what you are
13 saying is correct, that is disturbing.

14 DR. APOSTOLAKIS: I must say that this thought I
15 expressed is fairly recent, but I agree with you, I believe
16 the committee will have no objection to looking into the
17 matter more carefully, perhaps have a subcommittee meeting
18 -- we will invite the industry people and so on -- and come
19 up with some sort of a report to you with specific
20 recommendations, yes. It is not something that the
21 committee has been thinking about for a long time, it is a
22 fairly recent thought. But we thought it would keep the
23 meeting fresh by bringing it up.

24 DR. POWERS: Well, I think it is true that we have
25 had numerous licensees complain at the pace of going toward

1 risk-informed regulations is impacting the ability of
2 licensees to sustain a group of risk assessment experts on
3 their staff, that as this process slows down, then they
4 simply can't afford to have a group of people skilled in
5 doing risk assessments that aren't used in the licensing
6 process, that is the concern that they have, and several
7 licensees have expressed that concern to us.

8 It does take -- there is a spin-up time to become
9 knowledgeable in the processes of doing a risk assessment
10 and that is a discipline, and paying for that, educational
11 effort, could be a burden on the licensee if he doesn't ever
12 get to use it.

13 MR. BARTON: I think that will show, Dana, in the
14 Part 50 risk-informed pilots that are going on now, because
15 I think the pilots represent both ends of the spectrum with
16 respect to the expertise they have in house with PSA and how
17 much effort they are putting to it. So I think we will see
18 the result of that in a pilot.

19 DR. POWERS: It will be interesting.

20 COMMISSIONER McGAFFIGAN: I just want to point
21 out, as I understand it, if you come in with a risk-informed
22 license amendment at the moment, you get more resources.

23 DR. POWERS: Priority treatment.

24 COMMISSIONER McGAFFIGAN: You get priority
25 treatment. So that is something that we do today.

1 Secondly, I don't fully understand, I was at a NEI
2 meeting in May where I think Entergy was there talking about
3 the success of inservice inspection, risk-informed, you
4 know, their license amendments that they had gotten and how
5 much it was saving them. I don't know why, if the Entergy
6 data is true, and I assume it is, I don't know why we aren't
7 getting a lot of risk-informed inservice inspection license
8 amendments at the current time. You know, and people could
9 justify, if the Entergy data is correct, keeping these guys
10 on the payroll, because they would pay their salaries many
11 times over.

12 But, so there must be something else there.

13 MR. BARTON: I think it is too soon to tell,
14 really. I think a lot of them are sitting back and waiting
15 to see what success the initial applicants are having with
16 it, and is it really going to be a savings. And I think
17 then you are going to see the floods of submittals on
18 ISI-IST.

19 DR. APOSTOLAKIS: If I had an IPE that I suspected
20 was not the best in the world, I would be very hesitant
21 myself to come and propose an ISI program, because I know
22 that I will have to use to my IPE, and I will get all these
23 questions about the quality of my IPE.

24 COMMISSIONER MCGAFFIGAN: But isn't that
25 appropriate the first time?

1 DR. APOSTOLAKIS: Appropriate to ask, sure.

2 COMMISSIONER MCGAFFIGAN: If you have an IPE that
3 you are suspicious of.

4 DR. APOSTOLAKIS: I think, Commissioner, what
5 needs to be done is when documents like this are written, it
6 should be clear that the benefits of using risk information
7 overwhelm the benefits of not doing it. And right now it
8 isn't.

9 COMMISSIONER MCGAFFIGAN: Okay.

10 DR. APOSTOLAKIS: Especially the documents from
11 NEI go out of their way to say PRA is only a tool, PRA is
12 only this, you can always do it the other way.

13 COMMISSIONER MCGAFFIGAN: So why do they want to
14 do it?

15 DR. APOSTOLAKIS: But they shouldn't have the same
16 benefits because there is more information in the PRA.

17 CHAIRMAN MESERVE: If there are no other
18 questions, why don't we turn to the defense-in-depth.

19 DR. POWERS: Certainly. One of the activities
20 that the ACRS has pursued in recent years is attempting to
21 identify any pitfalls that lie on the road toward
22 risk-informed regulations, pitfalls that may not have been
23 anticipated. And we have certainly written to the committee
24 concerning the issues of the completeness of PRAs, their
25 ability to cover all modes of operation, the issues of

1 having acceptance criteria that were applicable to
2 individual licensees, the problem of risk communication,
3 which I think the Commission may be ahead of the ACRS as far
4 as recognizing.

5 Another one that we have written to the committee
6 about is the area of the role defense-in-depth will play in
7 a risk-informed regulation, and I will ask Dr. Kress to
8 discuss our concerns in this area.

9 DR. KRESS: The look at this subject matter was
10 prompted by a few instances in which we saw defense-in-depth
11 invoked as a constraint on making a risk-informed decision,
12 even the risk numbers would have said go forward with it.
13 And in the presence of that sort of instance, we asked
14 questions like -- that were quantitative, like how much --
15 if you make this change, how much will you impact
16 defense-in-depth? How much defense-in-depth do you really
17 need? Well, what do you mean by defense-in-depth in the
18 first place? And questions like, if your risk status is
19 very good, meaning a very low risk, should you be able to
20 relax some of these defense-in-depth requirements? They
21 seem to be cast in concrete and not part of the risk
22 tradeoffs.

23 Well, when we asked questions like that, we didn't
24 get very good answers. It turns out that there doesn't seem
25 to be a quantitative measure for defense-in-depth. It is

1 mostly judgment and it is spelled out in the regulations
2 that you meet certain requirements. But when you ask for a
3 quantitative measure of how much defense-in-depth do you
4 have, how much do you need, how much of it are you going to
5 change when you make a change, you really don't get
6 satisfactory answers.

7 So, we thought that that situation was one that
8 posed a likely threat perhaps to properly reaping all the
9 benefits you might get out of risk-informing the
10 regulations. So we thought we would take a look at it. And
11 the objective of our look was to see if there might be a way
12 to redefine defense-in-depth in such a way that you could
13 put a quantitative measure on it, so you could then possibly
14 put measures of necessity and sufficiency on it. And then
15 it wouldn't be so difficult to work into the risk-informed
16 system.

17 Well, we started out with a couple of assumptions
18 in making this look. One assumption was that the objective
19 of risk-informing the regulations was, of course, to achieve
20 an acceptable level of risk. And that defense-in-depth was
21 a design and operational philosophy by which one could
22 achieve this acceptable level of risk, but achieve it in
23 such a way that you give balanced attention to things like
24 prevention, mitigation and key safety functions. So we
25 started out with those two assumptions.

1 And we quickly I think recognized that how you
2 view the implementation of this philosophy depends on
3 whether or not you have the PRA tools that are appropriate
4 to do a risk assessment. And if the situation is such that
5 you do not have the capability to do a risk assessment, then
6 one would do a defense-in-depth philosophy very, very much
7 like what we have now, that is, you would define design
8 basis accidents, you would specify that these have to be
9 met, the requirements for them have to be met in such a way
10 that there is balanced attention to prevention, mitigation,
11 initiating events. You would specify multiple safety
12 provisions, you would specify things like redundancy and
13 diversity and multiple barriers to fission products.

14 This is what you would do, and that is what we did
15 in the absence of the ability to do a risk assessment. And
16 this has worked very well. It has I think met the
17 requirement that we provide adequate protection.

18 However, in a risk-informed regulation system,
19 there is a number of problems with this. The first one is
20 that if you did not have the risk assessment tools in the
21 first place, you really would not know what your risk status
22 was. It is a presumption. And it is a presumption of
23 adequate protection, but you don't really know what the risk
24 status is.

25 The second problem with it, the defense-in-depth

1 measures are scattered throughout the regulations. They are
2 not very specific, and there is not quantitative measures to
3 them, so that it is difficult then to provide a measure of
4 necessity and sufficient in this tight kind of system.

5 There is not quantitative measure. And, as a result, it
6 does lend itself, we think, to what we would call arbitrary
7 appeals to defense-in-depth when you are doing a
8 risk-informed decision.

9 So, the other view one could take of the
10 defense-in-depth role is that we have perfectly adequate
11 PRAs available to us with uncertainty analysis, and that the
12 objective is just to achieve an acceptable level of risk in
13 the regulations. But this view adds to the previous
14 structuralist view, we call -- we labeled the previous one a
15 structuralist because you can see it lends a structure to
16 the regulations, it puts -- it scatters the defense-in-depth
17 throughout that structure.

18 The second view, that if you had a good PRA, a
19 perfect PRA, or close enough to perfect, we labeled the
20 rationalist view. And what it adds to the structuralist
21 view is that this achievement of an acceptable risk has to
22 be done at an acceptable level of uncertainty, and that is
23 the new dimension of that. And it does not specify -- it is
24 almost a purely risk-based approach to regulation. It
25 doesn't specify how you meet these things, but it is pretty

1 clear that in order to meet the levels of acceptable risk
2 and acceptable uncertainty that we desire, you would pretty
3 much have to do a design process that is very much like what
4 we do anyway, providing balanced attention to various parts
5 of the regulations and even requiring things like multiple
6 barriers and redundancy and diversity. However, those would
7 not be required in this system.

8 The measure then of sufficiency and
9 defense-in-depth would be, have you met the risk acceptance
10 criteria at the level of uncertainty you find acceptable?
11 Because that is the classic confidence level approach to
12 statistical things. The problem with this approach is that
13 it provides almost complete reliance on a PRA, and I don't
14 think -- that requires some PRA capability that I don't
15 think we are ready for. There is just too much -- there is
16 such a thing as uncertainty in the uncertainty, and I think
17 that is big. I don't think we have a way to develop the
18 uncertainty to the proper level that we need to use that.

19 So, it doesn't -- it is a rational approach and
20 probably is a better theoretical foundation for
21 risk-informed regulations. It doesn't appear to us it is
22 practical to go to that extent. So our recommendation in
23 our report was a bit of a pragmatic marriage between the two
24 approaches, to take the best of both parts of those views.
25 And what we intended to do there was to say that you use the

1 structuralist approach at a high level in the regulations,
2 that is, you actually specify that you have acceptance
3 criteria on things like initiating event frequencies, core
4 damage frequency, conditional containment failure
5 probability, large early release frequency, and even maybe
6 frequency versus dose curves. You would specify acceptance
7 criterias on those. It is a risk allocation among these.
8 It is a way to express a preference for mitigation versus
9 preference -- versus prevention.

10 If you did that, then the idea was to do it in
11 such a way that you met each of these risk acceptance goals,
12 but that the overall goal, which might be LERF or prompt
13 fatalities, or the safety goals we going to have, are also
14 met at an acceptable level of uncertainty, or a confidence
15 level that we agree is what we want to meet at. This
16 acceptable level of uncertainty might very well be a
17 function of the achieved risk. If your achieved risk is
18 very good, a very low level, you could stand a bigger
19 uncertainty, a bigger acceptable level of uncertainty.

20 So what you would then do would be use your PRA to
21 determine these intermediate goals and to determine the
22 uncertainty in the overall goal, and that would be your
23 measure, quantitative measure of the sufficiency of the
24 defense-in-depth. That is where we pretty much left our
25 discussion at. It was I think a useful exercise that I

1 don't know how -- our recommendation was actually that the
2 staff look at this and see if there is a gem in too in there
3 that they could use when they approach this problem of how
4 to use defense-in-depth in a risk-informed regulatory
5 system.

6 DR. POWERS: I think it is fair to say that one of
7 our bigger concerns was not using defense-in-depth and
8 inappropriate in a risk informed regulatory environment.

9 COMMISSIONER DICUS: Absolutely.

10 DR. POWERS: Because we certainly see repeated
11 examples of where defense-in-depth is the basis for
12 retaining approaches that any risk analysis would say is not
13 a great deal of benefit.

14 CHAIRMAN MESERVE: How, if at all, does cost ever
15 get involved in this? I am thinking about an element of
16 defense-in-depth is very inexpensive, why not ask for it? I
17 mean it doesn't look like the way you have laid out the
18 options that -- there is a richer set of criteria, I think,
19 and cost being an obvious one -- that one might want to
20 weigh in the analysis and it doesn't seem to jump out, at
21 least, in the way you have described the approach to the
22 problem.

23 DR. KRESS: I think cost is a component in this,
24 and our approach was that once you determine the
25 intermediate risk acceptance criteria on the intermediate

1 goals that one would pretty much leave up to the designer
2 how he would meet those intermediate goals and how he would
3 achieve an overall level of uncertainty that is acceptable
4 and that he would in his choices for how he would meet those
5 he would opt for, if he could do it with lower costs I am
6 sure he would choose those options, so it would be in the
7 equation.

8 DR. POWERS: In meeting the criterion of adequate
9 protection we are constrained not to bring in the question
10 of cost and I think what we are looking at here is a risk
11 informed regulation defining what is acceptable risk to the
12 public, which I think you have to be very chary about how
13 you bring cost in though I will cheerfully admit that there
14 is a cost consideration that travels through the entire
15 regulation. It is a presumption, an assumption that people
16 have.

17 There are some things that you don't put --
18 nuclear power plants buried 15 miles deep in an all-gold
19 sphere because it just costs too much and it would be crazy
20 to do that, but I think that you still need to consider cost
21 in an implicit fashion even if an explicit consideration
22 really is -- you are constrained not to do that.

23 CHAIRMAN MESERVE: Greta?

24 COMMISSIONER DICUS: Yes, if I could, just a quick
25 question, and you mentioned some of this and maybe I just

1 need clarification or a little more about it, but it really
2 has to do with when we write a new regulation or when we
3 revise a regulations, which we are more revising than
4 writing new ones, and it falls a little on the Chairman's
5 question -- how do we measure the extent to which that
6 regulation embodies defense-in-depth or if it should.

7 DR. POWERS: They are very important questions and
8 I think that's the problem is you really can't go in and say
9 how much defense-in-depth do I have here?

10 COMMISSIONER DICUS: Well, I think that is where I
11 am going.

12 DR. POWERS: If I -- you can ask the question have
13 I violated the historical use of the concept of
14 defense-in-depth here, and I think the answer is often going
15 to be that, yes, when looking at subsystems I very well may
16 violate the original ideas of defense-in-depth that were
17 imposed when people broke these things down into systems and
18 subsystems and even components, but I am doing it because
19 now I have the capability of looking at the nuclear power
20 plant as an integrated whole that I did not have in the past
21 and I recognize I don't need defense-in-depth on this one
22 system because I have got defense-in-depth at another level
23 higher up.

24 DR. APOSTOLAKIS: If I can make a comment, I think
25 it would be tremendous progress, a step forward, if in

1 answering that question we identify the part of the problem
2 that is reasonably well represented by your PRA and the part
3 that is not and then say that tradeoffs regarding
4 defense-in-depth in the PRA part will be done using the
5 numbers of the PRA and there isn't such a thing as a
6 principle that we have to implement.

7 When the other part, the PRA doesn't do a good
8 job, then you have go to traditional ways and put some
9 defense-in-depth. That will be a very good step forward
10 when we start doing this, which is the rationalist view.

11 I think the structuralist view is helpful only at
12 a very high level, the cornerstones.

13 COMMISSIONER DICUS: Thank you.

14 CHAIRMAN MESERVE: Commissioner Diaz.

15 COMMISSIONER DIAZ: Yes. I am not sure this issue
16 will not be coming over and over again in the next few years
17 because it is obviously going to be here. However, we have
18 some short-term issues that we have to deal with.

19 We have this special circumstances and the
20 criteria that needs to be used. Does the ACRS have a
21 recommendation of how to balance risk information and
22 defense-in-depth, in how to establish this criteria to deal
23 with special circumstances to request more information when
24 the people have not submitted the information that we want
25 them to submit?

1 I mean this is the short-term issue and valuable
2 things that we will value the ACRS advice.

3 DR. KRESS: You are welcome to that one, George.

4 DR. POWERS: Well, I mean the issue that you refer
5 to is an issue that is, yes, very germane. We have a
6 mechanism available to us to address a licensee's request
7 for a change based on risk but the licensee chooses not to
8 do it, but we have looked at what he proposes to do and say
9 it could have risk consequences in doing that, and then what
10 does the Staff do?

11 The licensee has said no, I don't know anything
12 about risk -- I know about regulations and I comply with all
13 the regulations -- I am not giving you any risk information.
14 I don't have it. The question is can the NRC Staff ask him
15 to go get that. That is the explicit example that you have
16 there that is before us right now, and we would presume that
17 other examples like that are going to come along.

18 I think the ACRS's view on this was that, oh,
19 Staff feels like there are risk consequences on this? Yes,
20 Staff has every right to ask for the risk information. If
21 it is not delivered and Staff feels this risk information is
22 important in making its decision on whether it approves it,
23 then it is the burden of the Staff to develop that risk
24 information. They have to have the tools available to them
25 to do the appropriate kinds of risk analyses here.

1 COMMISSIONER DIAZ: But how do you balance
2 defense-in-depth if the licensee comes and says, look, I am
3 complying with every single possible defense-in-depth
4 approach and why do I need to do this? How do we balance
5 risk information and defense-in-depth?

6 DR. APOSTOLAKIS: I think the argument, as I
7 recall from reading the document, the argument the Staff is
8 making is that it is legitimate to ask for additional
9 information independently of its form if there is a question
10 of adequate protection.

11 Now in an earlier letter the ACRS recommended to
12 the Commission to revise the safety goals and consider the
13 possibility of having two numerical values. One would be the
14 tolerability limit, so to speak, to use the British
15 expression, that if you are above it we don't care about
16 cost, we shut you down and you cannot be there.

17 Then the goal is below. In between you do the
18 cost tradeoffs, and if you are below the goal we don't even
19 bother to look. You are fine.

20 Now if the Commission decided to do this, then you
21 would be doing at least two things. You could get closer to
22 defining adequate protection, which I understand some
23 stakeholders now are requesting, and second, you would give
24 numerical guidance to the Staff to answer Commissioner
25 Diaz's question because now they will say, look, the

1 Commission says that when it comes to the unavailability of
2 safety functions that number should not be greater than, I
3 don't know, five 10 to the minus 3, and we have reason to
4 believe that in this particular case you are there. Please
5 submit this information.

6 But right now they don't have the ammunition to do
7 that. They have to invoke this amorphous concept of
8 adequate protection.

9 COMMISSIONER DIAZ: Or assurance of adequate
10 protection.

11 DR. APOSTOLAKIS: Assurance of adequate
12 protection, yes. Yes, sir, thank you for correcting me.

13 COMMISSIONER MCGAFFIGAN: Your May 19th letter,
14 which I found interesting, you used fire as an example of
15 where us crazy old structuralists could continue to be
16 structuralists because PRAs are so weak at that point, and I
17 won't quote the letter. You guys wrote it, so you remember
18 it, but I read this letter, by the way, and I announced I
19 was a structuralist having read it.

20 [Laughter.]

21 DR. POWERS: You are a good man. I mean we always
22 knew that.

23 [Laughter.]

24 COMMISSIONER MCGAFFIGAN: One of the sentences
25 that got me, and I know it is not your recommendation, but

1 one of the sentences that got me was if, on the other hand,
2 one adopts the rationalist view even at that level, which is
3 at the high level, which is not what you are recommending --
4 I will admit that -- it's conceivable that the LERF
5 objectives could be satisfied without a containment.

6 That tells me I will never be a true and complete
7 rationalist because I am sure somebody is going to
8 manipulate their numbers and I think the modular high
9 temperature gas reactor guys have already been in saying,
10 you know, we don't need a containment on these reactors,
11 they are so inherently safe. I think the Commission long
12 before we were here said, no, guys, you are going to have to
13 have a containment.

14 But it strikes me it comes down to this quality of
15 PRA issue. You say for fires you can continue to be a
16 structuralist, you can continue to require defense-in-depth.
17 You probably would say for human -- what was the one you
18 were talking about earlier? Human performance? You could
19 continue to be a structuralist. There is a long list of
20 things I can continue to be a structuralist for, even under
21 your framework, so if there is a question here I guess it is
22 that there -- if I were a Staffer reading your letter and
23 really wanted to invoke the rationalist view at the lower
24 levels and have the structuralist view at the top, aside
25 from fire, where you tell me I can stay a structuralist, you

1 haven't given me a lot of examples of where and how you
2 would apply this mixed model of structuralist at the top and
3 rationalist down below, and also whether that requires
4 things like getting rid of design-basis accidents.

5 I mean you have to go back into the regulations
6 and get rid of that entire structure of regulation that --
7 in order to now use the PRAs that don't weight those
8 design-basis accidents as much as the design basis does. I
9 don't know what I would do. It is a good overall
10 explanation of structuralist versus rationalist but even if
11 I try to follow your example I don't know how to implement
12 it.

13 DR. APOSTOLAKIS: But the intent, Commissioner,
14 was not to solve the problem. It was to contribute to the
15 debate. This is an "advisory" committee --

16 [Laughter.]

17 DR. APOSTOLAKIS: Clearly this is a major
18 undertaking. I mean we are not talking about a part-time
19 committee doing this. As I recall the issue of
20 defense-in-depth when Chairman Jackson was here she
21 encouraged us to pursue it and contribute something.

22 COMMISSIONER MCGAFFIGAN: Well, you did.

23 DR. POWERS: The examples that come up -- we have
24 certainly encountered examples in the I&C area where
25 defense-in-depth is embodied in the way they design the

1 control systems and it was in fact control systems that
2 raised our first concerns about how defense-in-depth would
3 play in a truly risk informed world and were they
4 consistent, was there room for defense-in-depth there?

5 As a Commission I think you have this question
6 comes up in another context, a different shape, when you
7 look at the waste people and their activities, whether
8 defense-in-depth is appropriately applied at the subsystems
9 level or is something that is reserved for higher level
10 considerations.

11 DR. KRESS: To partially answer your question, I
12 think if you acted on our recommendation to do a combination
13 of the two it probably would mean you would abandon the
14 design-basis accident concept and in order to implement it,
15 you would have to come up with a whole new set of what I
16 have been calling acceptance criteria, so you would put
17 acceptance criteria on initiating events, CDF, conditional
18 containment failure probability -- and this is a policy.
19 How do you apply acceptance values to these?

20 I mean it is a preference. It is a judgment, and
21 you would have to have those as well as acceptance criteria
22 on the level of uncertainty you are willing to live with, so
23 you would have to do that, and you would that way preserve
24 the problem you had of -- you could have a system without a
25 even containment. You couldn't have if you properly set

1 those acceptance criteria. That would preserve your
2 structuralist view for you.

3 CHAIRMAN MESERVE: Commissioner Merrifield.

4 COMMISSIONER MERRIFIELD: This is a comment. It
5 is not a question but it is a follow-up comment to my fellow
6 Commissioner, Commissioner McGaffigan.

7 I don't think I would be so bold as he to outline
8 those areas in which I would have concern about this
9 analysis as it relates to changing our operations, but I do,
10 I understand the sentiment, and I think the sentiment is to
11 a certain extent we can sharpen our pencils and we can do
12 better analysis. We can pull out our silicon graphics
13 machines and run the model better, but in the end part of
14 what we have to keep in mind is it is not merely a rational
15 explanation and scientific determination of what we think is
16 the best thing to do.

17 We can sit around the table and we can discuss
18 what are the best outcomes from a scientific standpoint, but
19 what we always have to keep in mind is that we are serving
20 the public interest and that these decisions that we make
21 about what we require of our licensees are not merely a
22 calculus of what we believe is right from a scientific
23 standpoint.

24 It also has to include what our public expects,
25 and I know there are issues out there where some of our

1 licensees have spoken to me about, gee, if they did the PRA
2 there are certain things they would like to go ahead and
3 change relative to the requirements we have, and I have
4 cautioned them, you know, beware of what you ask for,
5 because I think the public has become very comfortable with
6 many of the requirements for some of the things around these
7 plants.

8 I personally have some concern about some
9 elements, although I am not going to outline them for fear
10 of being predeliberative, but I think that is something we
11 always need to keep in mind.

12 DR. POWERS: I think you raise the issue of risk
13 communication in thinking about this, that when we take and
14 we remove requirements or relieve the licensees on
15 requirements of a deterministic nature as a result of risk
16 analyses, it is important to be able to communicate to the
17 public that we have not in doing that raised their risk and
18 it is not transparently obvious to them that, for instance,
19 when we reduce requirements for fire protection based on
20 risk analysis that a member of the public can't claim his
21 risk has gone up. In fact I think he can but we have to
22 find a way to communicate to him that in fact his risk has
23 not gone up. It may have improved and actually gone down
24 because of greater focus.

25 That communication is one of the challenges that I

1 think we face as we move into a more risk informed
2 regulatory system and it is going to be because people are
3 not born with an innate knowledge of understanding of the
4 concepts of risk and cutsets and things like that, but it is
5 a new concept to them. We have got to carry the burden of
6 acquainting them with its advantages as well.

7 One of the challenges we face is that we of course
8 laid more on our plate than can possibly be consumed in the
9 time available.

10 I know you, Mr. Chairman, have a restriction on
11 the end. Your pleasure? We can go forth and touch on some
12 of the other issues that we have or we can cut at this
13 point. This is a nice breaking point.

14 CHAIRMAN MESERVE: Thank you, Dana. I think we
15 had better terminate this meeting because we are really at
16 the end of the allocated time.

17 Let me make just a couple of observations though
18 on my first real exposure to your work in sort of reading
19 through the materials in preparation for this meeting.

20 It is very clear to me that, first of all, that
21 you are extraordinarily helpful to us, that there are some
22 very profound changes that are underway in the Commission
23 now and having your thoughtful analysis of them, in stepping
24 back and looking at the underpinnings for the kinds of
25 things we are doing, is very, very important and very useful

1 to us.

2 The second thing that I just have to note is in
3 looking through the abundance of letters and abundance of
4 things that you are doing is that it is absolutely clear
5 that you are extraordinarily hard-working. This is a group
6 that is really stepping to the plate in very major areas and
7 helping us and I am personally and on behalf of my other
8 Commissioners I would like to say that we are very, very
9 appreciative of the significant efforts that you make.

10 So unless there are other comments that my fellow
11 Commissioners would like to make --

12 COMMISSIONER MERRIFIELD: Mr. Chairman,
13 actually -- and I certainly understand the concerns about
14 timeliness and certainly agree with you that we need to
15 conclude for today -- there are, unfortunately there were
16 some comments in some of the slides which I found most
17 interesting at the end, and so with your -- I don't know if
18 there is some way of perhaps -- you know, I can put those in
19 a written form and provide those to the committee or some
20 other format which I would like to air some of those
21 concerns in some manner.

22 DR. POWERS: We would be glad to, if we could find
23 a time, for you and I to get together and maybe the
24 cognizant member on the specific issues and -- if you have
25 time on your schedule.

1 COMMISSIONER DIAZ: Actually, if I may, I would
2 like to support Commissioner Merrifield's idea. There are
3 sometimes very little time and we have some questions. We
4 might have to decide on this, but I would like to be able to
5 submit some of those questions --

6 DR. POWERS: Sure.

7 COMMISSIONER DIAZ: -- to the committee for --

8 DR. POWERS: And we would be happy to entertain
9 them.

10 COMMISSIONER MERRIFIELD: I would like to have
11 those included in the public record so that we have a full
12 airing of the issues we are discussing today, if that --

13 CHAIRMAN MESERVE: Given that this is an Advisory
14 Committee, I think we would be obligated for you to do that
15 by public meeting or by a written communication with you.

16 COMMISSIONER MERRIFIELD: Let me suggest that on
17 the follow-on questions we will do that by written
18 communication and it may well be even on some of the areas
19 that we have discussed that as we reflect on the things that
20 were said today there may well be some follow-on questions
21 as to those as well.

22 Thank you, Mr. Chairman.

23 CHAIRMAN MESERVE: With that, we stand adjourned.
24 Thank you very much.

25 DR. POWERS: Thank you.

1 [Whereupon, at 11:32 a.m., the meeting was
2 concluded.]
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CERTIFICATE

This is to certify that the attached description of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: MEETING WITH
THE ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS --
PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Thursday, November 4, 1999

was held as herein appears, is a true and accurate record of the meeting, and that this is the original transcript thereof taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company

Transcriber: Rose Gershon

Reporter: Mike Paulus

**MEETING OF THE
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**

WITH THE

U.S. NUCLEAR REGULATORY COMMISSION

**INTRODUCTORY REMARKS BY
DR. DANA POWERS, ACRS CHAIRMAN**

NOVEMBER 4, 1999

TOPICS FOR DISCUSSION

- **Strategy for Reviewing License Renewal Applications**
- **Risk-Informing 10 CFR Part 50**
- **Relationship and Balance Between PRA Results and Defense-in-Depth**
- **Risk-Informing 10 CFR Part 50.59 (Changes, Tests, and Experiments)**
- **Low-Power and Shutdown Operations Risk**
- **NRC Safety Research Program**
- **Multiple SSC's Out of Service During Maintenance**
- **High Burnup Fuel Phenomena Identification and Ranking**

STRATEGY FOR REVIEWING LICENSE RENEWAL APPLICATIONS

- **ACRS statutory obligation to review License Renewal Applications**
- **ACRS activities being led by:**
 - **Dr. M. Bonaca**
 - **Dr. R. Seale**
- **The ACRS Strategy for the reviews has been developed and is being tested in the reviews for the two lead plants**
- **Attention is now on the strategy for the projected, steady-state rate of renewal applications.**

RISK-INFORMING 10 CFR PART 50

- **ACRS agrees with the staff's proposal for risk-informing 10 CFR Part 50.**
- **ACRS is concerned about the use of importance measures, the completeness of risk assessments, and the availability of risk assessments and technical bases documents for review by the staff.**

RISK-INFORMING 10 CFR PART 50.59 (CHANGES, TESTS, AND EXPERIMENTS)

- **ACRS recommended the staff consider bolder options including extension of Regulatory Guide 1.174 criteria.**
- **ACRS recommended that corrective or compensatory actions be given more prominence in allowing plant changes using risk insights.**

RELATIONSHIP AND BALANCE BETWEEN PRA RESULTS AND DEFENSE IN DEPTH

- **ACRS is concerned that arbitrary appeals to defense in depth can delay or deny the benefits of risk information.**

SHUTDOWN AND LOWER-POWER OPERATIONS RISK

- **NRC has limited capabilities to assess risk during shutdown operations.**
- **Even the best of current tools are poorly suited to the analysis of this risk.**
- **Current estimates of high risk during plant shutdown may be conservative.**
- **Industry is paying close attention to shutdown operations.**
- **NRC staff may be "out gunned" by licensees in the risk analysis of shutdown operations.**

NRC SAFETY RESEARCH PROGRAM

- **A thorough examination of the NRC research program.**
- **ACRS wants the report to be of use in planning by both the NRC staff and the Commission.**

MULTIPLE SSC'S OUT OF SERVICE DURING MAINTENANCE

- **ACRS has made note of the fact that the risk importance of systems change as systems are taken out of service.**
- **It is possible to produce large changes in risk as multiple systems are removed from service.**
- **Do not present operators with unanalyzed plant configurations.**

HIGH BURNUP FUEL PHENOMENA IDENTIFICATION AND RANKING

- **Burnup extensions are likely to be sought by licensees.**
- **What does NRC need to know to approve burnup extensions?**
- **The Phenomena Identification and Ranking process is a good way to find out.**

ACRS MEETING WITH THE NRC COMMISSIONERS

NOVEMBER 4, 1999

**STRATEGY FOR REVIEWING LICENSE
RENEWAL APPLICATIONS**

DR. MARIO BONACA

ACRS

ACRS Review of License Renewal

- **ACRS Will:**
 - **Review Every License Renewal Application and Related SER**
 - **Contribute to the Development of the License Renewal Process**
- **A Strategy Has Been Developed to Allow the ACRS To:**
 - **Timely Review the Expected Number of Applications**
 - **Continue Its Involvement in Other Issues**

12

ACRS Review of License Renewal (Cont.)

- **Elements of ACRS Strategy Include:**
 - **Four-step Review of Initial Applications and First-of-a-kind Nuclear Steam Supply System (NSSS) Designs**
 - **Two-step Review of Subsequent Applications**
 - **Interactions with the Staff to Support Standard Review Plan (SRP) Development and to Assist in Resolving Contentious Issues**
 - **Focusing ACRS Review on Significant Technical and Process Issues**

ACRS Review of License Renewal (Cont.)

- **ACRS Is Encouraged by its Review of the Initial Applications**
 - **Existing Plant Aging Degradation Management Programs Are Extensive**
 - **Few New or Modified Programs Are Required for Life Extension**
- **The Staff Is Developing an Effective Rule Implementation Process**

ACRS MEETING WITH THE NRC COMMISSIONERS

NOVEMBER 4, 1999

RISK-INFORMING 10 CFR PART 50

**DR. GEORGE APOSTOLAKIS
ACRS**

10

IMPORTANCE MEASURES

1. Used to rank Systems, Structures, and Components according to their risk significance.
2. Used in Graded Quality Assurance (GQA) and In-service Inspection (ISI).
3. Currently in Option 2.
4. Fussel Vesely (Fv_j) = (sum of sequ. containing component j)/(baseline CDF)
5. Risk Achievement Worth (RAW_j) = (new CDF with component j down)/(baseline CDF)
6. $FV > 0.005$ $RAW > 2$

OBSERVATIONS

- 7. Ranking is sensitive to baseline CDF assumptions, e.g., conservatism and configuration.**
- 8. The relationship to the guidance in RG 1.174 regarding Δ CDF and Δ LERF is not established.**
- 9. Special treatment requirements affect *groups* of SSCs, while the ranking is based on individual SSC measures.**
- 10. The calculation of (*new CDF with component j down*) in RAW may be more involved than what is currently done.**

11

RISK-INFORMED 10 CFR PART 50

- ACRS report dated December 14, 1998, Committee recommended:
 - Voluntary conformance to risk-informed revisions to 10 CFR Part 50.
 - Use of pilot plants and exemptions.
 - Approval of the staff's two-phased approach including definition of safety-related.
 - A clear articulation of regulatory objectives.
- In a Staff Requirements Memorandum dated June 8, 1999, Commission approved the staff's multi-option approach and policy issues in SECY-98-300.
- ACRS Subcommittees on Reliability and PRA and on Regulatory Policies and Practices met on July 13 and September 24, 1999, to review the staff's proposed rulemaking plan (Option 2) and study (Option 3) for risk-informed revisions to 10 CFR Part 50.

RISK-INFORMED 10 CFR PART 50

- ACRS report dated October 12, 1999, the Committee:
 - Agreed with the staff's proposal to develop a new regulatory Section 10 CFR 50.69 and associated Appendix T.
 - Agreed that the current terminology for structures, systems, and components (SSCs) should be preserved and that additional terminology referring to safety significant SSCs should be considered.
 - Recommended that the staff evaluate the information content of importance measures and that guidance and training be provided for expert panel members.
 - Recommended that policy issues regarding safety goals and defense-in-depth be resolved before the Option 3 plan is fully implemented.

ACRS MEETING WITH THE NRC COMMISSIONERS

NOVEMBER 4, 1999

RISK-INFORMING 10 CFR PART 50.59

DR. GEORGE APOSTOLAKIS

ACRS

RISK-INFORMING 10 CFR 50.59 (CHANGES, TESTS AND EXPERIMENTS)

- ACRS report dated July 16, 1998, offered an ACRS member recommendation for the development of a risk-informed framework for 10 CFR 50.59 using frequency-consequence curves.
- ACRS report dated December 11, 1998, Committee recommended:
 - Identification of areas where risk information can enhance the process.
 - Better definition of terms including: safety status, adequate protection, defense-in-depth, safety margins, and operational safety.
 - Consideration of bolder options and extension of principles and guidelines in Regulatory Guide 1.174.
 - Giving more prominence to corrective or compensatory actions in allowing collective plant changes using risk information.

RISK-INFORMING 10 CFR 50.59 (CHANGES, TESTS AND EXPERIMENTS)

- EDO response dated January 29, 1999, stated that evaluations of risk insights would be considered in the broader revisions to 10 CFR Part 50. As such, the Committee plans to review:
 - Certain regulations (e.g., 10 CFR 50.59) that may be expedited for risk-informed revision under the proposed rulemaking plan (Option 2) for 10 CFR Part 50.
 - NRC study (Option 3) for additional risk-informed changes, beyond the current 10 CFR Part 50 rulemaking effort, may involve revising design-basis accidents and associated requirements.
- Near-term action: December 1999, ACRS scheduled to review proposed NRC regulatory guide endorsing industry guidance in NEI 96-07, Guidelines for 10 CFR 50.59 Safety Evaluations.”

ACRS MEETING WITH THE NRC COMMISSIONERS

NOVEMBER 4, 1999

**RELATIONSHIP AND BALANCE BETWEEN PRA
RESULTS AND DEFENSE-IN-DEPTH**

**DR. THOMAS S. KRESS, CHAIRMAN
REGULATORY POLICIES AND PRACTICES
SUBCOMMITTEE**

MAJOR THEMES OF THE ACRS REPORT

- **The Major Objective of the NRC Regulation is to Achieve an Acceptable Level of Risk**
- **Defense-in-Depth Consists of Those Measures Taken to Compensate for Uncertainty in the Ability to Assess Risk**
- **The Issue is ...How Can Necessary and Sufficiency Limits be Determined in Order to Curtail Arbitrary Appeals?**

THE STRUCTURALIST VIEW

- **Design Basis Accidents are Specified. These are to be Coped with Via Balanced Attention to Prevention and Mitigation by Addressing Key Elements of Design and Operation**
- **Redundancy and Diversity are Required for Key Safety Functions:**
 - **Scram Capability**
 - **Emergency Core Cooling**
 - **Long-Term Cooling**
 - **Emergency Power**
- **Multiple Barriers Against Fission Product Release are Specified**
- **Emergency Response Measures are also Generally Considered to be Part of Defense-in-Depth**

ISSUES WITH THE STRUCTURALIST VIEW

- **Lacks Specificity as to Just What are Purely Defense-in-Depth Measures and the Adequacy of These**
- **The Measure of Sufficiency is Judgment (Are All the Key Elements Addressed in a Balanced Manner?)**
- **Readily Lends Itself to Arbitrary Appeals**

THE RATIONALIST VIEW

Objective: To Achieve Acceptable Risk at an Acceptable Confidence Level

- **The Level of Uncertainty Determines the Acceptable Risk Level**
- **Rather than DBAs, Risk-Related Regulatory Objectives are Specified Requiring Assessment of the Full Spectrum of Accident Sequences**
- **Design Measures (Can be the Same Measures as in the Structuralist View) Can be Placed Anywhere and to the Extent Deemed Appropriate by the Designer**
- **Defense-in-Depth are Those Features the Designer Chooses to Use to Meet the Risk Objectives**
- **The Measure of Adequacy is Whether or Not the Risk Acceptance Criteria Are Met at the Required Level of Confidence**

ISSUES WITH THE RATIONALIST VIEW

- **Almost Complete Reliance on Imperfect PRAs (Uncertainty in the Variance is Large and Unquantified)**
- **A Preference for Prevention Versus Mitigation Requires Setting Intermediate Goals (There are no Technical Basis for Choosing any Particular Values for These as Being Acceptable)**

SUMMARY

That the Structuralist View be Implemented at a High Level Supported by the Rationalist View

- **Key Elements Would Still be Identified (e.g., Frequency of Initiating Events, CDF, CCFP, LERF, F-C Values)**
- **Redundancy and Diversity Could Still be Required for Key Safety Functions**
- **The “Balanced Attention” to the Key Elements Would be Defined by Setting Acceptable Limits on the Key Elements to be Determined at Specified Confidence Levels**
- **The PRA-Assessed Values for the Limits and Confidence Levels Would be the Measure of Sufficiency**

ACRS MEETING WITH THE NRC COMMISSIONERS

NOVEMBER 4, 1999

LOW-POWER AND SHUTDOWN OPERATIONS RISK

**DR. ROBERT SEALE
ACRS**

- **Fundamental to implementing a risk-informed regulatory approach is the ability to identify risk significant SSCs.**
- **Fundamental to responsible burden reduction is the ability to identify those SSCs that are not risk significant.**
- **The risk significance of individual SSCs depends on the plant configuration and the initiating event that triggers a specific challenge to plant safety.**
- **Full power operations are conducted with well defined standard plant configurations for 70-85% of the time. Current SSCs risk assessments are based wholly on this portion of the plant operation.**

- **Low power operations involve reactivity changes for <5% of the time. Reactivity changes have had a role in initiating plant upset conditions in excess of the level suggested by the relatively limited time spent in these changes (Zack Pate Paper).**
- **Plant shutdown exists for 10-25% of the time. Configuration alternatives vary widely and include hot shutdown, various system maintenance, test, and inspection configurations including “mid-loop” operation, and cold shutdown. The enhanced risk of some of these configurations is recognized by provisions for special “watch” or other diagnostics in existing plant procedures.**

25

- **Maintenance, test, and inspection activities routinely remove target SSC's from service, reducing the availability of accident mitigation capabilities. The available SSC's are more risk significant for these configurations. The status of individual SSC's will change throughout an outage, hence the risk is dynamic.**
- **Careful attention is needed to the assessment of low-power and shutdown risk. Configurations are more diverse and external initiators (cranes in the switch yard) arcane. Recovery from plant upset is usually feasible, but the path to achieve recovery is not proceduralized.**

ACRS MEETING WITH THE NRC COMMISSIONERS

NOVEMBER 4, 1999

NRC SAFETY RESEARCH PROGRAM

**DR. GRAHAM WALLIS, CHAIRMAN
SAFETY RESEARCH PROGRAM SUBCOMMITTEE**

118

- **In a Staff Requirements Memorandum dated September 9, 1997, the Commission requested the ACRS to:**
 - **Examine the need, scope, and balance of the Reactor Safety Research Program**
 - **Examine how the Office of Research is positioned for the changing environment**
 - **Examine how well the Office of Research anticipates research needs**
 - **Take an active role in reviewing ongoing Research Program Initiatives**
 - **Recommend whether the Nuclear Safety Research Review Committee (NSRRC) function is still needed**

- **The ACRS issued two reports to the Commission , NUREG - 1635 Vol.1 (1998) , and NUREG-1635 Vol. 2 (1999)**

- **In NUREG-1635 Vol. 1, the ACRS made several recommendations regarding the NRC practices and processes for identifying and prioritizing research needs. In addition, the ACRS commented on 13 specific research activities**
- **In NUREG-1635 Vol. 2, the ACRS provided additional information concerning the research needed to support Commission programs, especially risk-informed regulation. The report also addressed 11 research areas**
- **For the Year 2000 ACRS report to the Commission, the Committee is examining the Top- Down approach in identifying the key decision areas and the relation of RES activities to the NRC Strategic Plan**

- **SOME LIKELY TOPICS:**

- A. Support for anticipated Commission decisions (license renewal, fuels, risk-informed regulation, licensee initiatives)**
- B. Identification of research needs, useful products**
- C. Relationship of research to agency goals and strategic plan**
- D. RES research vision**
- E. ACRS concerns (risk assessment, margins, measures of safety, defense-in-depth, effect of regulations in the field)**

ACRS MEETING WITH THE NRC COMMISSIONERS

NOVEMBER 4, 1999

**MULTIPLE SSC's OUT OF SERVICE
DURING MAINTENANCE**

MR. JOHN BARTON

ACRS

27

- **ACRS reports dated April 14, and May 11, 1999 recommended the following modification to language proposed by the staff to the proposed final revision to 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"**
 - **Scope of the assessment may be limited to structures, systems, or components that a risk-informed evaluation process has shown to be significant to public health and safety for the proposed configuration**
 - **ACRS recommended that the configuration risk management program in Regulatory Guide 1.177 not be adopted**
 - **ACRS also supported the staff's position that the safety assessment should consider all components that are taken out of service at the same time and should not be limited to high safety significant SSCs**

24

ACRS MEETING WITH THE NRC COMMISSIONERS

NOVEMBER 4, 1999

**HIGH BURNUP FUEL PHENOMENA
IDENTIFICATION AND RANKING**

**DR. DANA POWERS, CHAIRMAN
REACTOR FUELS SUBCOMMITTEE**

- **Over the past two years, the ACRS discussed and reviewed with the staff the NRC's high burnup fuel activities. The ACRS concerns include the capacity of high burnup fuel to survive accidents such as LOCA and ATWS.**
- **Test findings and operational events, such as control rod sticking and axial distortion of the neutron flux, suggests that high burnup fuel does not behave in ways anticipated by simple extrapolation of data for lower burnups.**
- **The ACRS urges international technical participation (e.g., France, Germany, and Japan).**
- **Current Regulatory Criteria is for fuel burnups to 62 GWD/t (peak rod average).**
- **NRR concluded degradation of fuel and cladding up to 62 GWD/t does not pose significant threat.**

- **RES is conducting research to confirm this regulatory decision.**
- **RES is conducting an expert opinion elicitation to identify physical and chemical phenomena that will affect fuel behavior, establish the state-of-knowledge concerning these phenomena, and rank them in terms of their importance to safety.**
- **Phenomena identification and ranking tables (PIRT) will be performed for accident scenarios that are risk important such as LOCA for PWRs and BWRs, Control rod accidents for PWRs, and ATWS for BWRs.**
- **ACRS in its letter of March 24, 1999, endorsed RES approach regarding the PIRT process.**
- **ACRS recommended that PIRT will provide a sound technical basis for refining the NRC's confirmatory research.**

2/11

- **ACRS urged NRR to participate in the PIRT process for extended fuel burnups.**
- **ACRS recommended that RES should develop the formalism for conducting and documenting the expert opinion elicitation, and augment the elicitation to include accident source term issues for high burnup fuels.**
- **Licensees will be expected to provide all data and analyses needed to support approval beyond 62 GWD/t.**
- **RES has not been asked to resume the broad program to exploratory research.**

4/9