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



STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:
ANNETTE L. VIETTI-COOK, Secretary of the Commission
KAREN D. CYR, General Counsel
DANA POWERS, Chairman of the ACRS
GEORGE APOSTOLAKIS
JOHN BARTON
MARIO BONACA
THOMAS KRESS
ROBERT L. SEALE
WILLIAM SHACK
JOHN SIEBER
ROBERT E. UHRIG
GRAHAM B. WALLIS



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,



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

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

DR. SIEBER: Thank you, sir.

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

DR. APOSTOLAKIS: Thank you.

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



this morning.

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

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

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

We look forward to this meeting and look forward to an open and candid discussion with you. For those in the audience, I understand that copies of the handouts are

available and I hope that all of you got them and they are at the entrances of the room. I suggest that we proceed by having each of the presentations completed and then we will

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

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

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

[Laughter.]

COMMISSIONER MERRIFIELD: -- "Go, Jumbos."

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

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

COMMISSIONER DICUS: No, you go ahead.

COMMISSIONER MERRIFIELD: I just want --

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

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[Laughter.]

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

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

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

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

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

Now we can get started with the meeting.

CHAIRMAN MESERVE: Thank you. Dana?

DR. POWERS: I guess it's fair to say that George and I have looked forward to calling you Chairman Meserve

once again in another context. Over the last nine months, the ACRS has been working intensively and closely with the Staff, even collegially with the Staff, to resolve issues that the Commission had highlighted with Congress. That includes the resolution of a variety of generic safety issues, revision of the approach the Staff uses for the inspection and assessment of nuclear power plants, and even the incorporation of concepts of risk into the enforcement of its requirements and the revision of the very important Rule 50.59.

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

Well, at this point I think I want to turn



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

DR. BONACA: Good morning.

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

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

On the other hand, I believe that under my second



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

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

For these applications we will have a four-step process. By four-step process we mean two subcommittee meetings, typically the first one lasting two days, and the

first one is timed with the review of the first SER.

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



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

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

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

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



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

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

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

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



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

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

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

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



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

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

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

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

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



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

And then others have said, well, how can you possibly make a decision about license renewal so far in advance of when the license actually expires and we should wait until it is closer to the time of expiration. Or if

you agree with the license renewal at this point, I mean what about ten years down the road, you find something different.

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



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

COMMISSIONER DICUS: Exactly.

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

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

DR. BONACA: Right.

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

DR. POWERS: I think it is also important to



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

COMMISSIONER DICUS: Thank you, Mr. Chairman.

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



more important to safety and, therefore, that will

eventually focus you into those areas. And we will be much appreciative of the fact that you will be able to dedicate the resources in the right areas.

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

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

DR. BONACA: That's right.

CHAIRMAN MESERVE: Ed, do you have any questions?

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



at the Calvert Cliffs application?

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

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

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

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



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

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

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

COMMISSIONER McGAFFIGAN: And as a general matter, I am not putting words in your mouth, but you welcome that

information, the whole committee and all your subcommittees, whether it is license renewal or fire, or Part 50 or whatever.

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

CHAIRMAN MESERVE: Commission Merrifield.

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



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

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

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

There has been too much debate on what has my



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

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

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

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

COMMISSIONER MERRIFIELD: Okay. Thank you very

much.



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

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

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

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

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



important issues to come out of this.

CHAIRMAN MESERVE: Any other questions?

COMMISSIONER DICUS: No. Thank you.

CHAIRMAN MESERVE: Why don't we proceed.

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

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

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

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



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

We wrote a long series of comments on importance measures, and the purpose here is not to bring up detailed

technical comments to the Commission, the idea is to sensitize you to the fact that these measures play a significant role in many of the new risk-informed Regulatory Guides. They are used extensively in the graded quality assurance programs, inservice inspection, and they appear to be central to the so-called Option 2 of risk-informing Part 50.

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



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

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

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

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



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

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

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

So if you sit back and think about it, you will

have to reach the conclusion that you are asking for trouble if you quantify risk and come before the Commission, because then you get all sorts of questions about your completeness of your PRA, the quality of your PRA. You have prove that



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

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

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

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

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



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

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

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

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



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

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

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

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



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

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

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

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



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

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

And there is a lot of -- there are a lot of good ideas there that one can borrow and develop good measures for the reactor side. The big difference is that we are

dealing with yes/no events most of the time, Boolean type things, and they are dealing with physical phenomena, chemical phenomena, so they have coupled codes and all that. But the ideas are there.

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



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

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

DR. APOSTOLAKIS: Yes.

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



to whether it discourages PRAs or not?

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

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

CHAIRMAN MESERVE: Any other questions?



COMMISSIONER DICUS: Yes, let me ask a couple of questions with regard to risk-informing Part 50. One of them has to do with research and the other one has to do with research and our new reactor oversight process. The

first one with regard to research. Could you give me some idea of what areas of research will be the most supportive or risk-informing Part 50?

DR. APOSTOLAKIS: I think --

COMMISSIONER DICUS: Dana is smiling.

DR. APOSTOLAKIS: I will preempt you.

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

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



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

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

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



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

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

DR. POWERS: I would just add to Dr. Apostolakis's point to say that I think, yes, we need to have a standard for the PRA that we can do now, one everyone agrees that if you live up to this standard you have an adequate assessment that can be relied upon to draw conclusions from, even if that does not extent to all of the modes of operations that the regulations cover and only addresses some portion of it.

You still have this need to have something that as a technical community we can all agree that a PRA done this way is acceptable detail, acceptable accuracy to regulatory conclusions from.

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

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



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

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

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

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

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



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

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

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

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

COMMISSIONER DICUS: It should be plant-specific.

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

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



Sometimes you find one defective but next time none, so this

random variability has to be accounted for. You can't work only with frequencies and I haven't seen a good discussion of how this will be accounted for and I think the reason is again because they don't start with the plant-specific performance indicators.

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

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

DR. APOSTOLAKIS: Yes.

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

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

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



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

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

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

[Laughter.]

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

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

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



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

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

have not seen them.

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

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



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

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

COMMISSIONER DICUS: Thank you, Mr. Chairman.

CHAIRMAN MESERVE: Commissioner Diaz.

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

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

Do we have the appropriate tools to determine what



that is?

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

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

I remember one time, you know, some time ago before this pilot started somebody came and said it should not be high risk significant or low risk significant, it should be a continuum, it always should be, and my point was that our regulations really have a hard time dealing with

that case, that we need to partition it into, you know, I



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

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

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

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

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

[Laughter.]

DR. APOSTOLAKIS: And the progressive --

MR. BARTON: That's biased.

COMMISSIONER DIAZ: That seems to be a bias.

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



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

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

COMMISSIONER DIAZ: There is voluntary and there is voluntary.

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

MR. BARTON: Special circumstances also.

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



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

COMMISSIONER DIAZ: I understand what you said. I think -- exactly. I was trying to extrapolate to what will the Commission have to consider as a policy issue in regards of determining how far to go into establishing pathways that are more risk informed, medium risk informed, and how are we going to be able to regulate them? How will the licensee be

able to say I am in this regime and how do I get regulated, because that will determine what the quality of the PRAs have to be.

DR. APOSTOLAKIS: Yes. Sure.

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

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

COMMISSIONER DIAZ: Technical basis.

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



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

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

COMMISSIONER DIAZ: Thank you.

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

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

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

[Laughter.]

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



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

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

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

DR. APOSTOLAKIS: No, that was maintenance rule.

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

DR. APOSTOLAKIS: Yes. My comments were not

intended to criticize the existing document and the effort to make it, to bring stability. My comments had to do with risk informing 50.59. I am looking for the future, in other words --

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COMMISSIONER McGAFFIGAN: I work on a good enough standard today and --

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

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

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

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

COMMISSIONER DICUS: Right.

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

COMMISSIONER McGAFFIGAN: And that is going to have to be changed?

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

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

CHAIRMAN MESERVE: Commissioner Merrifield.

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

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

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

COMMISSIONER MERRIFIELD: Okay. The second thing I want to mention, obviously, you know, the staff has been working on the 50.59 issue and on the Reg. Guide. I know they have made comments to me about the degree to which ACRS

has engaged in this effort and they feel that you all have been very accommodating to their very aggressive schedule for this. So I guess what I want to say was, you know, they have been saying good things about you and you ought to know that. But given --

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

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

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



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

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

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

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

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

COMMISSIONER MERRIFIELD: Yes.

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



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

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

COMMISSIONER MERRIFIELD: One last thing I want to

ask about, you described the road taken and the road not taken, and the fact that licensees are not engaged in the PRA as much as they should be because of perhaps some of the structures that we put on top of it. Obviously, we as a Commission have committed significant resources to try to encourage people to become more risk-informed and to use that PRA analysis.

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

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

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

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

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

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

DR. POWERS: It will be interesting.

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

DR. POWERS: Priority treatment.

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

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Secondly, I don't fully understand, I was at a NEI meeting in May where I think Entergy was there talking about the success of inservice inspection, risk-informed, you

know, their license amendments that they had gotten and how much it was saving them. I don't know why, if the Entergy data is true, and I assume it is, I don't know why we aren't getting a lot of risk-informed inservice inspection license amendments at the current time. You know, and people could justify, if the Entergy data is correct, keeping these guys on the payroll, because they would pay their salaries many times over.

But, so there must be something else there.

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

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

COMMISSIONER McGAFFIGAN: But isn't that appropriate the first time?



DR. APOSTOLAKIS: Appropriate to ask, sure.

COMMISSIONER McGAFFIGAN: If you have an IPE that you are suspicious of.

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

COMMISSIONER McGAFFIGAN: Okay.

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

COMMISSIONER McGAFFIGAN: So why do they want to do it?

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

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

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



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

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

DR. KRESS: The look at this subject matter was prompted by a few instances in which we saw defense-in-depth invoked as a constraint on making a risk-informed decision, even the risk numbers would have said go forward with it. And in the presence of that sort of instance, we asked questions like -- that were quantitative, like how much -- if you make this change, how much will you impact

defense-in-depth? How much defense-in-depth do you really need? Well, what do you mean by defense-in-depth in the first place? And questions like, if your risk status is very good, meaning a very low risk, should you be able to relax some of these defense-in-depth requirements? They seem to be cast in concrete and not part of the risk tradeoffs.

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



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

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

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



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

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

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

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

measures are scattered throughout the regulations. They are not very specific, and there is not quantitative measures to them, so that it is difficult then to provide a measure of necessity and sufficient in this tight kind of system. There is not quantitative measure. And, as a result, it does lend itself, we think, to what we would call arbitrary appeals to defense-in-depth when you are doing a risk-informed decision.

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

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



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

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

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



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

If you did that, then the idea was to do it in such a way that you met each of these risk acceptance goals, but that the overall goal, which might be LERF or prompt

fatalities, or the safety goals we going to have, are also met at an acceptable level of uncertainty, or a confidence level that we agree is what we want to meet at. This acceptable level of uncertainty might very well be a function of the achieved risk. If your achieved risk is very good, a very low level, you could stand a bigger uncertainty, a bigger acceptable level of uncertainty.

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



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

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

COMMISSIONER DICUS: Absolutely.

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

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

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



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

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

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

CHAIRMAN MESERVE: Greta?

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



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

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

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

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

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



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

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

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

COMMISSIONER DICUS: Thank you.

CHAIRMAN MESERVE: Commissioner Diaz.

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

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



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

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

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

does the Staff do?

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

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



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

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

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

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

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



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

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

COMMISSIONER DIAZ: Or assurance of adequate protection.

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

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

[Laughter.]

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

[Laughter.]

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



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

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

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



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

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

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

[Laughter.]

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

COMMISSIONER McGAFFIGAN: Well, you did.

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



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

As a Commission I think you have this question comes up in another context, a different shape, when you

look at the waste people and their activities, whether defense-in-depth is appropriately applied at the subsystems level or is something that is reserved for higher level considerations.

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

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



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

CHAIRMAN MESERVE: Commissioner Merrifield.

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

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

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

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



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

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

DR. POWERS: I think you raise the issue of risk communication in thinking about this, that when we take and we remove requirements or relieve the licensees on requirements of a deterministic nature as a result of risk analyses, it is important to be able to communicate to the public that we have not in doing that raised their risk and

it is not transparently obvious to them that, for instance, when we reduce requirements for fire protection based on risk analysis that a member of the public can't claim his risk has gone up. In fact I think he can but we have to find a way to communicate to him that in fact his risk has not gone up. It may have improved and actually gone down because of greater focus.

That communication is one of the challenges that I



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

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

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

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

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

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



to us.

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

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

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

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



COMMISSIONER DIAZ: Actually, if I may, I would like to support Commissioner Merrifield's idea. There are sometimes very little time and we have some questions. We

might have to decide on this, but I would like to be able to submit some of those questions --

DR. POWERS: Sure.

COMMISSIONER DIAZ: -- to the committee for --

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

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

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

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

Thank you, Mr. Chairman.

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

DR. POWERS: Thank you.



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