

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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PUBLIC MEETING

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Nuclear Regulatory Commission

One White Flint North

Rockville, Maryland

Thursday

October 2, 2003

The Commission met in open session, pursuant to notice,
Chairman Nils J. Diaz presiding.

COMMISSIONERS PRESENT:

NILS J. DIAZ, Chairman

EDWARD McGAFFIGAN, JR., Member of the Commission

JEFFREY MERRIFIELD, Member of the Commission

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STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE

Secretary

General Counsel

DR. MARIO BONACA, ACRS Chairman

MR. JOHN SIEBER, ACRS

DR. WILLIAM SHACK, ACRS

DR. THOMAS KRESS, ACRS

DR. GRAHAM WALLIS, ACRS Vice Chairman

DR. DANA POWERS, ACRS

PROCEEDINGS

CHAIRMAN DIAZ: Good morning.

It just occurs to me that every time that we meet we are anchoring both sides of this table by our, you know, wonderful legal counsel, Karen Cyr and by our secretary, Annette Vietti-Cook. And we often forget to say thank you. But we feel very comfortable with them at the end of the table. It kind of provides some balance. And they are more aggressive than the Commission, so you guys be careful.

It is really a pleasure to get together with you again. We appreciate the opportunity to meet with ACRS in public. We understand that you have a lot of important issues to deal with. We believe that the support that the committee provides the Commission on these technical issues that are complex is extremely valuable to us.

We understand that sometimes you press and you probe and you test the staff results. You sometimes even test the Commission, which is okay also. But it's amazing how when you look at these meetings, there are some things that are continuing. But there's always new issues. And I'm sure that you realize that we appreciate you balancing between the old and the new so that the Commission can get the benefits of your insights.

And with that, I will see if my fellow Commissioners have any comments.

COMMISSIONER MERRIFIELD: No, thank you,
Mr. Chairman.

CHAIRMAN DIAZ: Dr. Bonaca?

DR. BONACA: Thank you. Good morning.

This morning we have four presentations. My presentation is an overview of current and future ACRS activities. I will start with my presentation.

The first item I will talk about is license renewal. We are quite engaged with this process and we have reviewed three applications since April 2003. And we have three more that we will review between October and December 2003.

We responded to the SRM on improvements to the generic license renewal guidance documents in June 2003. We felt that the interim staff guidance was effective. And also we found it extremely responsive to the ACRS concerns on documentation that prompted the SRM. So that was quite, I think, an effective set of interim guidance that had been provided.

We are planning to review five applications in calendar year 2004.

And as always, exploring means to further streamline the ACRS review of license renewal applications. I want to say that I feel that our review now is quite efficient already. We have come to reduce our time of involvement and yet I think we are covering the substance of the technical issues which I think are important for the applications.

To a degree, the increasing reliance of applications on GALL, on a standard process allow us to focus more on the plant

specific issues. For example, identification of the history of the plant, repairs that may have occurred, plans that are being made at the specific plant for those repairs in the period of time of continued operation.

Moving on, risk-informing 10 CFR 50.46. I can now report that we have not written a report on this because we have been briefed just once on the use of expert elicitation process to develop LOCA frequency. But we are very interested in seeing the results of this process. We had planned a meeting on that in November of this year. It will review the results of the elicitation during the fall of 2003.

We plan to review the proposed rulemaking in response to the March 31, 2003, SRM prior to it being forwarded to the Commission.

And we will work with the staff to reconcile some of the challenging issues that we will have been faced, challenging technical issues.

Still on risk-informed activity, we are planning to review, I believe in November again, the proposed 10 CFR 50.69, which is actually the implementation of option 2.

We provided comments and recommendations to the Commission on March 19, 2002. And we also discussed this issue with the Commission on July 10, 2002. So you are aware of our thoughts on that process.

We are planning a meeting in the fall of this year to

review the draft final 10 CFR 50.69, to look at staff resolution of public comments, staff resolution of ACRS comments and recommendations, and particularly, we are looking for the NEI implementation guidance and staff's endorsement. Because there are issues there that would address some of the concerns that the ACRS had raised.

Moving on to advanced reactors. We are reviewing currently two power plants. One is the AP1000 design. We held four subcommittee meetings and one full committee meeting to discuss the AP1000 design aspects, PRA, the thermal-hydraulic issues and DSER open items.

There are still a number of open items there to be resolved. From our perspective, one of the issues that we are still dwelling with is the reliability of the ADS-4 Squib Valve which is still a question. We are questioning the reliability on demand since this is an expanded size valve with respect to what has been tested before.

And we are also questioning the frequency assumption of this valve.

The ACRS full committee meeting just met. I mean, we met to discuss status of resolution of open items.

And we were planning an ACRS full committee review of the FSAR in July 2004. In reality, it seems as if it will slip to about September 2004 because the issues will not be closed by that time. I mean, we are ready to initiate a final review as soon as the issues are closed.

Regarding the GE/ESBWR, or economically simplified, BWR, this design is based on the GE/SBWR and ABWR designs. It's a passive design based on circulation flow driven by a chimney effect and the elimination of recirculation pumps, jet pumps, and associated valves and piping reduces the number of locations where reactor coolant system leakage could potentially occur.

We have held one subcommittee meeting and one full committee meeting to review thermal-hydraulic issues and design aspects and will continue to review these design aspects and associated staff review efforts.

I would like to move on to the next item on the agenda which is power uprate review standard. We reviewed the draft final extended power uprate review standard in September 2003, and found it to be a quality document effective and responsive to the ACRS concerns. We had this presented before. This standard would allow continuity in the reviews.

We expect to review up to seven power uprate applications in calendar year 2004. And we will probably revise the ACRS review criteria for power uprate applications greater than 5 percent after staff implementation of review standard.

We have initiated some communication with the staff prior to each uprate. The staff will communicate to us the nature of the uprate, whether it is a recapture or a stretch or an extended uprate. Based on that information and the extent to which the plant has been

modified, hardware changes and so on, we will then make a determination on whether we want to review it. And in some cases, we will not.

Now, for below 5 percent, maybe there may be some above 5 percent, 6 or 7 percent, that we will choose not to review because the changes are not significant.

For BWR's, we expect to review mostly extended uprates. For PWR we have not yet reviewed any power uprate. Therefore, I think for the first ones we will review them just to familiarize ourselves with the process and the issues that are more significant for PWRs.

Coming to future ACRS activities, this is a laundry list of activities. Clearly, they are not coming our way all at the same time, fortunately. But this gives you an indication of what we expect to see over the next 12 months.

First of all, clearly, risk-informed and performance-based regulations. Already I gave you two examples, 50.46 and 50.69 that we will be involved with. Advanced reactor designs, again, we are involved in the design certification of AP1000. We have had some review, pre-application reviews and early site process and applications.

Thermal-hydraulic codes, both TRAC-M and industry codes. That still involves thermal-hydraulic subcommittee quite heavily.

We had a briefing yesterday on the materials degradation program. And we are going to certainly be engaged in reviewing and working with the staff on that issue.

We are going to be involved with the steam generation action plan. Some of the actions in the action plan are in response to an ACRS recommendation from the DPO. So we are going to be involved with those.

I already mentioned license renewal and core power uprate applications.

The bullet above actually speaks of the mixed oxide fuel fabrication facility. We have conducted a review of that. I believe we are one final review away from the final SER that may come to us. As you know, that's in part -- our involvement is that it is a statutory responsibility to review the MOX fuel facility.

And on my final slide I have listed here high-burnup fuel issues. We just had a subcommittee on that issue there.

Safeguards and security matters, we are quite involved with that. We plan to issue a report today at this meeting. We already issued a report previously.

Resolution of generic safety issues. They are becoming less in number. But, you know, for example, the sump blockage issue, it's one of these. And we are involved as the issues come to us.

We have an initiative that we have taken some time ago to review significant reactor operating events, periodically, every two or three months, we have somebody. We are looking there for trends. I mean, is there anything that we see in the industry that says we should be aware that there is a trend that we should pay attention to and

review.

We are preparing a safety research program -- we are reviewing the safety research program and will write a full report this year.

And finally, we are still involved in fire protection matters. There have been quite a number of developments in that. And so we will be involved in that.

That completes my presentation. And next presentation is from Mr. Sieber who's going to address the material degradation issues.

MR. SIEBER: Thank you.

My discussion today will involve material corrosion issues. And even though corrosion and cracking of metals has been around since time in memorial, and, in fact, we were aware of these types of degradations 40 years ago in pressurized water and in boiling water reactors, the Davis-Besse incident has brought new attention to the matter of cracking in the reactor coolant system pressure boundary.

So today I'm going to concentrate on the Davis-Besse phenomenon and also the South Texas project, the bottom head cracking that occurred in the flux symbol tubes.

As I said, cracking has occurred in Alloy 600 control rod drive mechanisms in some PWRs in the United States and also elsewhere. And the phenomenon has been known and observed in control rod drive mechanism penetrations for over 10 years in

commercial reactors.

Both axial and circumferential cracking have been observed along with some leakage of borated primary coolant through the cracks.

Initially it was thought that circumferential cracking would be more serious than axial cracking because if you crack around the parameter of a control rod guide tube and it separates, you will have a rod ejection accident accompanied by a loss of coolant accident. Neither one of which are pleasant experiences.

On the other hand, the Davis-Besse cracking that occurred caused the severe head erosion was an axial crack rather than a circumferential crack and had the potential to perhaps cause some probability that it could have caused a loss of coolant accident at least as large as the ejection of a control rod.

What was unusual about the Davis-Besse situation was not the formation of the crack itself but the erosion of the head material which was not expected.

That brings attention to the fact that any place where Inconel or Alloy 600 as it's now known today or one of its similar materials is used, requires some additional attention from licensees and from the agency to make sure that cracking is not occurring and going undetected.

In the case of the South Texas project, the licensee on its own initiative -- and I give South Texas folks great credit for taking that

initiative did a bottom head inspection of the 50-odd penetrations in the bottom head and found two of them that had very small leaks. Both of which had been repaired.

This was a little different than the reactor vessel top head cracking because we know that cracking is sensitive to the temperature at which the material is exposed. And, of course, the bottom head is roughly T cold temperature, and the top head, in some plants, could be as much as 75 degrees hotter than that.

So this wasn't totally anticipated, however, the licensee did find it. And the industry, with these discoveries, did a number of things.

If I could have the next slide, please.

The industry's response was to develop a susceptibility algorithm for penetration cracking and boric acid corrosion. And in addition to developing an inspection protocol, and then track industry inspection results data and finally to develop a prediction methodology for vessel head penetration, boric acid corrosion.

The susceptibility algorithm that EPRI developed is empirical and is based on the time that the reactor was at operating temperature and what the head temperature was in that particular reactor. The hotter the temperature, the more susceptible the plant would be to have a cracking phenomenon.

It is well known, however, that other factors also influence Alloy 600 cracking, including material composition, the heat number,

stress intensity factors, local surface chemistry, heat treatment, and welding techniques.

However, it is believed and assumed that the most important factors are time and temperature. And for the purposes of scheduling inspections, those two factors are sufficient in our opinion and in the staff's opinion for that purpose.

In developing the inspection protocol, the important factors include when to inspect and how often to inspect it. And for this, this is where you need the susceptibility algorithm. And also what combination of inspection techniques to use.

In the vessel penetrations, both the top head and the bottom head, the geometry is not conducive to good thorough inspections. The initial inspections were visual and the top head, in some reactors, is very congested and you can't see everything that you need to see to do a good visual without the use of remote equipment. And a similar condition exists at the bottom head.

And so some combination of visual and volumetric is necessary to be able to fully cover the area of interest.

Next slide, please.

The agency took swift action in addressing these discoveries as they occurred. And for this I give the staff and the agency great credit for being prompt to react to this situation and also thorough.

The staff issued four bulletins and one order and an

information notice, all related to these events.

The first bulletin was actually issued in 2001, before the Davis-Besse discovery. The second and third bulletins were issued after the Davis-Besse discovery and were designed to be more specific in what was expected of licensees to establish that their facilities were safe to operate.

The order simply codified the staff's expectations so that it was enforceable.

And the last bulletin addressed the South Texas project's bottom head inspections and vulnerabilities.

The information notice also involved South Texas and was an early warning that was issued shortly after the cracking was discovered in that plant.

In addition to that, the staff established a Davis-Besse lessons learned task force. And that task force did a very thorough job of examining all the details, including licensee and staff actions that were taken, good or bad, so that the agency and the industry would learn from this experience and be able to provide even better response in the future.

The work of the Davis-Besse lessons learned task force action plan is still on-going today.

The ACRS has been regularly kept informed of issues in the staff's progress as the situation unfolded.

And the ACRS wrote three letters on the subject. Those

letters included conclusions and recommendations.

And the first one we did conclude that there is a sound technical basis for the head degradation plan. However, we recommended that the action plan be augmented. Specifically, we need to better be able to predict reactor pressure vessel lower head penetration cracking.

Now, we have the susceptibility algorithm for the upper head. But the lower head being colder, the mechanisms for cracking are not completely understood because the conditions are different than they would be for the upper head.

In addition, we recommended that the action plan be strengthened, including development of susceptibility algorithms that address other reactor pressure vessel penetrations in addition to those on the head, flaw evaluation guidelines need to be enhanced to consider the residual stress profile and to re-evaluate the susceptibility of uncertainty in crack propagation rate predictions.

Qualification criteria for reactor pressure vessel head penetration inspection techniques should be enhanced so inspections are capable of adequate defect characterization, including crack sizing and orientation.

The treatment of other degradation modes for high chromium nickel-based alloys, which include Alloy 690 which is becoming a substitute for the use of Alloy 600, and the associated weld materials, Alloys 182, 82, 152 and 52.

Now, there is an extensive database for Alloy 600. But the database for the metallurgical performance of these other alloys is not nearly as good. So additional research needs to be done, perhaps by the industry or the agency to further develop the database for these additional nickel-based alloys.

In this regard, we believe that industry and agency collaboration would be a cost-effective way to do it, provided that the staff does their own independent analysis and collaborates on the collection of test data and the running of the tests.

In general, we support the staff's consideration of research that goes beyond the Davis-Besse Lessons Learned Task Force action plan, namely, the development of pro-active life management for materials degradation issues. Now, we just heard about this yesterday afternoon as a full committee. But I have talked to the staff recently to get an idea of what their thinking has been.

In such a pro-active approach, that would mean that the agency will be able to better predict what issues are coming as opposed to being in a reactive mode so that deficiencies are discovered and the staff then has to scramble to react to it.

This approach requires the agency and the industry to develop a comprehensive knowledge of the expected modes of degradation in all materials in all safety systems, perhaps by using the PERT process, which is a known way to rank phenomenon. In this way, we can deal not only with the reactor pressure vessel but the

reactor coolant system and all the other safety systems.

And if you look through the materials of degradation, there have been materials problems due to aging in quite a few of the systems.

Current work set forth in the action plan partially covers these aspects. But there are additional work that will need to be done that currently is not covered by user need.

We basically, as the ACRS, support staff's action in this regard. And as the staff develops the details and tells us about them, we will be able to give a more informed opinion on the specific details of what they plan to do.

So thank you very much.

DR. BONACA: The next presentation is from Dr. Shack on reactor oversight process.

DR. SHACK: The committee is continuing its interactions with the staff over the reactor oversight process. Like virtually all the other shareholders, we believe that the reactor oversight process is a considerable improvement over the previous assessment processes for the licensee performance.

Many of our utility members are veterans of the SALP process. And they appreciate the more objective treatment of data, essentially, the more consistent treatment that you get from the ROP.

We also think that the inspection guidance that's provided with the ROP helps focus attention on important issues. But yet it

essentially still provides enough flexibility that enables inspectors to follow their own initiatives and insights and we think leads to an effective inspection process.

The action matrix also provides more specific and essentially consistent guidance on how the staff is to escalate its response with regard to performance. So overall, again you have a much more objective and systematic treatment. I think it's more understandable to the licensees and to the public and all the other stakeholders.

We have written a number of letters on this. Let me just sort of a chronological record that's not particularly important.

The bottom line question at the moment is the effectiveness of the process. And as I said, we believe it is an effective oversight process. It provides an objective assessment. It's accepted by the stakeholders. It has good public outreach.

There are problems, however.

The Davis-Besse event obviously has raised concerns about the ROP. We have a situation where, in fact, there certainly does seem to be deficiencies in performance. But they were not identified by the reactor oversight process.

And if there is a weakness, it's essentially an insufficient emphasis on the cross-cutting issues. The cross-cutting issues are the way that the reactor oversight process addresses the broader question of safety culture in an objective performance based way.

A second, I think, less important problem is, again, there's still some disproportionate assessment in performance between cornerstones that we think that there's a heightened significance in the action matrix and the SDP process. There can be a sort of a heightened significance to cornerstone where the SDP is basically done on a prescriptive, deterministic basis, rather than ones where we can really have a realistic risk basis for us.

And I think the staff is aware of that. You know, those adjustments are continuing and they will be made. The most important one probably to us is this emphasis on the cross-cutting issues.

Looking at some other remaining ACRS issues with the ROP. We have had some extensive discussion with the staff over how performance or the thresholds for the performance indicators should be set. And the Commission directive was to make them risk informed. And the staff has made them risk informed.

We believe that it's actually very difficult to do risk-informed thresholds for an individual PI because you are focusing on a single aspect and trying to extrapolate only that portion of the performance to the overall behavior. And we think that's an insufficient way to do it and that we are better off to do the thresholding on a performance based way, the way we do now for the green-white thresholds.

And as I have said, we have had extensive discussions with the staff. We have sort of agreed to disagree over this.

From my own viewpoint, I'm not sure that this is of great practical importance. The truly important threshold, most of the time, will be the green-white threshold. Licensees don't want to go white. They are going to work very, very hard just to avoid that threshold. And so I think it's very unlikely that we will be dealing with yellow-red thresholds very often. The green-white thresholds are already performance based.

The need, as I have said before, is perhaps to give increased attention and emphasis to the cross-cutting issues. And one way to do that would be a performance indicator that's really related to the cross-cutting issues.

And so we think that, you know, in this consideration of additional performance indicators that go with the ROP, it's important to develop one that would focus on the cross-cutting issues. And, again, it's not really our role to propose performance indicators. But in our own discussions, we think the corrective action plan performance indicators related to that are a natural place.

And again, utilities have their own measures of tracking those. INPO has measures of tracking those. And we believe that a performance indicator focused on the correction action plan is something that should be considered.

Again, we think that again you will have to consider reviewing the action matrix and the SDPs to make sure that we get consistent results between those SDPs where we are basically basing

our response on a more prescriptive way and those in the risk-informed ways. And I think that's a matter of sort of continuous development.

And that's basically what I wanted to cover on the ROP.

DR. BONACA: We have one final presentation from Dr. Kress on the improvement of the quality of risk information for regulatory decision-making.

DR. KRESS: Well, this presentation discusses our recent letter of May the 16th, where we focused on some aspects for improvements in PRAs.

This letter had benefit of a study that ACRS commissions. This is an unusual thing for ACRS to do. The study was done by Technology Insights, in particular, Karl Fleming up there.

One of the things he did was survey about 20 members on the staff, NRR and Research. And he was seeking input from these people on what would be the needs for improving PRA from their perspective.

One of the interesting findings of that study, to me anyway, was that a substantial number of these staff members have the belief that the current incompleteness of industry PRAs and insufficient quality of PRAs posed a major impediment to advancement in risk-informed regulation.

That's a serious finding, I think. And the study didn't really tell us why the staff has this belief. But I can speculate on a couple of reasons.

One of them is our PRA quality standard that was developed, ASME and ANS, espouses the concept that the scope and quality of the PRA need only be good enough to be commensurate with the application that it's being used for. What that does, in my mind, is it requires the staff to make two rather difficult judgments.

One is what is the scope and quality of this PRA I'm faced with from the industry, and is that scope and quality good enough for this application?

Those are actually pretty difficult judgments to make. And they have to do it for every application that comes in or for every use they put it to.

The second reason I speculate on is that the risk-informed decision-making process that's put forth in Reg Guide 1.174 actually calls for a matrix of absolute value of CDF and LERF. If you're going to have absolute values, how do you get those if you have an incomplete, insufficient quality PRA?

The staff has to make judgments on what the missing parts do to this PRA. And those judgments are not always easy to make. And there's not any guidance available for how to do that.

And so, you know, while we, the ACRS committee, has come down saying that the principle of scope and quality being commensurate with the application is probably a good principle, some of us are beginning to question whether it's really worth the efforts.

And, you know, the natural tendency and progression is

that as applications get more and more involved, the industry PRAs and the ones that the staff use will get better and better and will approach a complete high quality PRA at some time.

And some of us on the committee think it might be better just to bite the bullet and go ahead and use a good complete PRA of high quality for all applications and not worry about having to make these judgments that may be inconsistent, time consuming, and burdensome.

So with that as kind of a thought in mind, we developed this letter on which some areas for improvements in PRA -- we tend to do this periodically with PRAs -- and we suggested that only a few areas -- highlight only a few areas for improvement.

They were the need to use full scope in all modes. I suspect you may be getting tired of hearing that from us. But still we repeated it.

We also highlighted the need to better incorporate operating experience in PRAs.

And we highlighted the need to quantify model uncertainty.

Now, with respect to the scope and modes, we noted that quite often when risk-informed decisions are being made and PRAs are submitted, that the bounding analysis are used to screen out the fires and often seismic. And that low-power and shutdown is generally not included at all.

And we believe that these type of a PRA with these missing parts do not always serve the risk-informed purposes well because we believe that you can miss important sequences where they may be interactive between fire and seismic. And you can miss risk insights.

And probably more importantly, we think that the ranking of importance measures -- use of importance measures to rank and characterize risk-significant systems and components can be skewed in this process. And you may miss some things that you would not have missed if you had a full high quality, full scope PRA.

Our letter didn't really ask the staff to do much in this area. What we did ask was that they consider developing guidance in only two areas.

The first area was to better incorporate operating experience to improve the completeness of PRAs.

And that came about based on an observation in Fleming's report that there may be as many as 20 percent of events evaluated by the ASP program, which means they screened out a lot of things and the ones they really evaluated are the ones that had the potential to have some risk significance.

As many as 20 percent of these involved initiating events and sequences that are not even in our PRAs. So we think there is an incompleteness in the initiating events and sequences that could be improved if this operating experience could be used to improve PRAs.

And we thought it would be useful if the staff looked into this and see if there was some guidance that they could develop on how to take that type of good information and feed it back to improve PRAs.

The second area that we asked the staff to consider developing guidance on was on the quantifying model uncertainty. You know, the risk informed process does call for incorporating uncertainties in the decision process.

What is usually submitted with the PRAs is an uncertainty analysis that's developed by signing distributions to initiating events, the distributions to failure frequencies, distributions to event probabilities, and propagating that through the PRA by Monte Carlo, they end up with a distribution on end product.

That's why we have labeled this parameter uncertainty. That's what we usually get. But it really turns out that the PRA results are somewhat insensitive to these uncertainties. They are not a big contribution.

And we noted in our letter that the biggest contribution to uncertainty was model uncertainty. That's due to our ignorance on how to model phenomenon.

We based that on the NUREG 1150 study which is the only place I know of where model uncertainty has been quantified. The NUREG 1150 quantified it by expert opinion solicitation.

It was a big deal. It was hard to do. It took a lot of time, a

lot of effort.

It's probably unreasonable to ask for a NUREG 1150 model uncertainty with every submittal that comes in for risk-informed application or for every use of the SPAR models even for risk-informed applications. But there have been some recent studies out and references that we referenced in the back of our letter that talk about maybe less burdensome ways to quantify model uncertainty.

So we asked for was that the staff look at those references and consider the possibility of developing guidance on a less burdensome way to at least estimate this model uncertainty.

I note that the staff is getting ready to issue Reg Guide 11.20, which does discuss some of these needs, including model uncertainty. And so they are aware of all of this and aware of our opinion. I don't think we are telling them anything that they are not already considering.

And I guess that's the gist of what I had to say about our letter.

DR. BONACA: This completes our presentation.

CHAIRMAN DIAZ: Thank you, Dr. Bonaca and the members for a very focused presentation. We appreciate you zeroing in on the issues that are presently most important to the Commission. I believe that today is the turn of Commissioner Merrifield to go first.

COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman. I have got quite a few areas I would like to look into.

Hopefully we can move through this.

I had an opportunity, Dr. Bonaca, to review the letter that you sent the Commission on September 30th relative to Reg Guide 1.82, recommending that the draft final revision be issued in order to facilitate the license -- facilitate licensing response and resolution of technical issues.

That was sort of the first page recommendation.

Then I had an opportunity to go through the detailed discussion on pages 2 through 6. And I noted on page 5 you go into a great deal of concern in detail regarding the phenomenon that might be associated with the screens or blocking of the sump strainers.

So there's -- to me, as sort of looking at those two, there seems to be a bit of a disjunct between the recommendation on page 1 and the level of detail, including the end, on page 5. So I'm wondering if you could help to clarify some of that for me.

DR. BONACA: That's an excellent question. We discuss the issue at length in fact. Should we recommend to release this document now?

And the sense was that it is important to move the process on. Our objections were mostly with the technical basis that the licensees will have to use to address the requirements which are described in the guide.

But I would like to ask Dr. Wallis, who lead us through that review, to address this.

DR. WALLIS: Well, I think there are two questions. One is, do we need a Reg Guide to get the licensees busy doing the appropriate work, responding to the actual phenomenon in their plant so that the agency has the information in order to make decisions?

And then the other question is, when we get that or while the licensees are doing that, what is the technical basis on which they evaluate these phenomenon?

So there are two issues, really. One is should the Reg Guide be issued in order to get things going, to get the responses needed in order to know what's what? And then, given that, what analysis methods are they going to use in order to make predictions about these phenomenon?

There are two questions. So we said, yes, we should do this. We debated a lot about -- is it appropriate to do it, but we said if you hold up the Reg Guide, then you are holding up the process of getting this information. And we felt that that was inappropriate.

And we believed that we had to at the same time evaluate the technical basis which was presented to us.

So these are really two parts. I don't think one precludes the other in any way.

COMMISSIONER MERRIFIELD: So by taking that view is -- I'm going to characterize this, so you can feel free to challenge me on it. But it strikes me that the way it's presented in the letter recognizes that it's a serious technical issue but one that is not so

critical as for us to sort of stop the train, so to speak.

DR. WALLIS: Well, this is why we ended up recommending risk-informed approach. There's nothing that we have reviewed in respect to this Reg Guide which tells us, really, how important is this. We felt that the work done, the technical work done by Los Alamos particularly is focused on the compliance issues, particularly the large break LOCA.

Because of some of the doubts about what happens with these phenomenon, the approach is if you don't have a realistic analysis, make conservative assumptions. So when all of this piles up, we want to know, well, what's the effect on risk?

There's got to be a risk-informed decision. We felt that this was a real example of where there's a lot of technical information but it has got to be put in some risk-informed perspective in order to make decisions. We haven't considered that side of the question yet.

COMMISSIONER MERRIFIELD: So we need to get some more information and look at it more carefully.

DR. WALLIS: I think we are feeling that we don't know whether this is -- looking at the extreme tail of what might happen -- and that's deciding everything. When you put it in a risk perspective, we would have much more better understanding of what ought to be done. We haven't seen that.

COMMISSIONER MERRIFIELD: I guess part of what I'm trying to probe for is that you are saying that the staff, we really

recommend you go look at this, try to understand it, look at it in a risk-informed way. And you are saying for some sort of level of balance.

But you are not putting any enormous red flags with this, is what I'm saying?

DR. WALLIS: If we thought there were an immediate safety concern, we would have said so.

COMMISSIONER MERRIFIELD: And you did not?

Thank you.

Dr. Kress, you had a very detailed comment about where you are on PRA quality. Obviously, we have been engaged in a very active effort to risk-inform our regulations, both in 50.46 and 50.69. And PRA, obviously, has been a very important element in all of that.

In the initial parts of your comment, you said that as a whole -- although I guess there's some degree of division with this as there is in a lot of ACRS issues, that the licensees ought to just go ahead and bite the bullet.

Now, obviously, one of the things that we have got to do on our side of the table is sort of balance things out, taking in a whole variety of factors to determine where we come up with our decisions.

One of the axioms that you always find in Washington, D.C., is that it's always easy to spend somebody else's money.

And one of the responses that we have been getting in the public from folks who are in the regulating community, who would

be the biters, I guess, is that the cost of this is so high that that would preclude them from engaging in a lot of these risk-informed activities.

Now, some might say, well, you know, you have got to pay to play, so to speak. But on the other hand, it would seem to me that what we have identified in our efforts to risk inform our regulations over the last course of years is it's not merely a benefit to the licensee that we pursue these activities, but, in fact, is a benefit to the agency as well. Because what it allows us to do is to focus our resources as a Commission on those areas which have the greatest impact on safety.

And I would use as an argument our better understanding right now than where we were five or ten years ago about the risk of fire. I think we put more emphasis on fire protection than we did before and that's a good thing. That comes, I think, out of our efforts to risk inform our regulations.

So what troubles me is if by having them bite the bullet, we raise the costs so high as to preclude people wanting to go down the road of risk-informed regulation, that may also have a negative impact on what we are trying to do in the utilization of our own resources. How do we balance that out, given your comments?

DR. KRESS: That's an excellent perspective. I don't think we intended to tell the industry what to do. We can't control their resources or dictate to them.

What our thoughts were is if we are going to properly risk inform our regulations -- and that's mostly an internal thing at NRC --

we need good PRAs to do that. And perhaps the SPAR models that we are developing could serve that purpose rather than the particular industry PRAs.

So it may be there where we need to apply our own resources rather than industry's resources, to make our processes more efficient and better risk informed.

I do have a vision, though, that some day this agency would have a PRA endorsed by each plant, full, complete with uncertainty analysis at hand and they could run it for every plant and add up all the effects. You know, I think that's a progression that some day will get here. I don't think that I would ask the utilities to jump into that right away.

I just suggest that it may be in their own interest to see how to improve their PRAs as they go along and apply their resources. It may be better off from a resource standpoint if you had these better PRAs, both the utilities and the staff -- I haven't made a good economic analysis. So I don't know what it is.

COMMISSIONER MERRIFIELD: I understand what you are saying. And I appreciate the rule of vision. And certainly, it's good to have a vision like that. There's nothing wrong with having a vision that all utilities have top flight PRAs. Nothing wrong with that vision. I share that vision.

I vision some day that I would like to fly in space. But that may or may not occur, either.

I guess I sort of look at it from the old axiom, maybe because my family was in the hardware business years ago. You know, you match the tool with the job. I think if you need to drill a hole and you are a homeowner, you need a different tool than if you are a contractor and you drill holes every day. That's sort of the philosophy of how I look at it, let's match up the tool and its ability with what you need to get accomplished.

DR. KRESS: That's all well and good. But there's this little element in our decision process that says we don't want to exceed some acceptable risk level for a plant, and to really define what an acceptable risk level is we have the safety goals which is pretty much it.

But having that as a regulatory objective, not to have a given plant exceed in acceptable risk levels, you have to know how calculate that. And you know you could use estimates and bounds for the missing parts. And you could estimate the model and parameter uncertainties and factor that into the acceptance criteria.

But I personally think you really need to have a pretty good PRA to make those assessments or some guidance on how to deal with missing parts, some better guidance than we have. That might serve the purpose.

COMMISSIONER MERRIFIELD: I don't disagree with the notion that we need to think about different ways of enhancing it -- there may be some areas where we can certainly take a look at it.

I want to move on to a couple questions about design

certification, two quick questions.

You mentioned that there are, as it relates to the AP1000, that there are a significant number of open items that remain to be resolved. And I'm wondering if you could briefly characterize the issues of significance and whether there are any which you think maybe the show-stoppers that the Commission needs to be concerned about.

DR. BONACA: At this stage, we haven't seen show-stoppers. There are some issues still being debated between the staff and the applicant that are significant. They have to be resolved. The staff is working with Westinghouse. And I believe that likely they are going to come to a resolution of those issues.

COMMISSIONER MERRIFIELD: You didn't mention at all the ACR 700, the CANDU 700 design. Are there any near-term plans of ACRS in that regard, given the desire of ECL to come in to pursue pre-application review?

DR. BONACA: Maybe you can help me with that, Tom.

DR. KRESS: We haven't scheduled an advance reactor subcommittee meeting. We are anxious to do that as soon as we find out what ACR's plans are for their submittal.

Perhaps John could help us out.

COMMISSIONER MERRIFIELD: I will tell you what. I'm going to let you off the hook on this one. You guys can get back to me at some point later on that issue.

The last one -- and I will finish up with this. I appreciate

the patience of my fellow members. On slide 15 of Dr. Bonaca's presentation, there is a slide regarding safeguards and security matters.

And I guess more than a question, it is a comment. You know, in looking at Section 29 of the Atomic Energy Act, security was not an item that was specifically mentioned in the charter of ACRS. I think this is something that obviously you all have shown some interest in on your own.

I have to say, we have an awful lot of highly technical issues which certainly do fall within the scope of areas that we do need ACRS review. We have got a whole brand new group of folks in NSIR and lot of long-term dedicated employees who are spending a lot of time on securities issues.

And I think that from my own standpoint I'm not certain this is necessarily an area that we get the biggest bang for the buck out of the very highly qualified members of the ACRS that we have.

That's my own personal opinion. Obviously, I would suggest an additional consultation with the Commission because this would fall, to me, within the areas that would fall under duties as the Commission may request. I'm not under any understanding that we have actually requested that at this point. Although I may be corrected on that. But I just want to note that for the record.

Thank you, Mr. Chairman.

CHAIRMAN DIAZ: Thank you, Commissioner Merrifield.

Let me just start with Dr. Bonaca and go in that order, I guess.

Just a personal comment, I think, you know, all of our regulations are equally important. However, there are some that are more equal than others. In this case, at the present time, I think that 50.46 and 50.69 seem to be that they are more equal than others, not because of what they are in themselves but of the potential impact on the future of risk-informed regulation.

Looking at these two potential rulemakings as a whole, do you have what I will call a feeling of that we are doing the right thing with these two rulemakings? Is that the consensus of the ACRS?

DR. BONACA: I think so. I think that the committee feels that 50.46 is a challenging issue and we are anxious to see the first results of the elicitation process, clearly. But it's -- you know, we are very supportive of risk informing option 2 also. It's a very important activity.

We expressed some concern about the risk three catchall and the need for a better defined deterministic process that identifies some of the commitments that some of the equipment has not because of CDF but other requirements of the regulation.

And I think that NEI understands very well the concerns that are coming back with the guidance that we are, you know, we are waiting to see. But I believe the committee is fully supportive of these activities.

CHAIRMAN DIAZ: So I'm sure the committee has given a significant amount of attention to this issue. There's no -- smoking gun is not the word -- smoking pipes?

DR. BONACA: Well, I think you already saw our comments on 50.69. They are pretty much closed. They were generally supportive of the application. We support the SDP application for option 2. I think that was effective.

We had questions, of course, because there are technical issues. And they have been already communicated by the staff. But --

CHAIRMAN DIAZ: I'm going beyond the letters. Is there an assurance that the approaches are consistent from the technical viewpoint that committee provides on this issue? That's what I'm looking for?

I mean, this is --

DR. BONACA: I think in the context of the SRM that specified certain bounds and certain limits, I cannot express now the opinion of the whole committee because we have not really discussed this issue to have -- I feel reasonably comfortable because I think that the SRM specifies certain bounds where I will have some discomfort.

CHAIRMAN DIAZ: Well, if you haven't, then may I suggest that it is about time.

DR. BONACA: So we are really, as you can imagine, pretty anxious to see the results of the elicitation process. That's the first step of significance there.

CHAIRMAN DIAZ: And in this respect, I have to go back to my training on random events, stochastic events, and pseudo random events.

And you know I think the last time I saw the elicitation, everything was going in the same direction, which raised a red flag with me. So I like to see a little more going both ways because that means that somebody is actually doing his job.

So I hope when you look at it -- and it is a very important issue -- that the committee will zero in on the, you know, depth of the comments and coverage of the issue. Because this is a very important issue. It not only relates to this issue but it actually relates to the materials degradation problems and how do we eventually start to predict and inspect, which are two things that are not separable in our regulatory structure. We have to do both, predict and inspect. They are both important.

Let me quickly go to, you know, something you said about light water reactor designs and power arrays. And I was looking at this.

I just came from a meeting in Toronto on the generation IV and all of the six concepts and then we have seven. There seems to be a proliferation of issues in here.

I'm sure that this is something that's done naturally. But it might be very good to look at the new light water reactor designs and say, what have we learned generically from addressing the safety of these systems? What have we learned?

Can it make our life easier in the future?

We don't want to, every time somebody comes with a light water reactor to start the ball rolling again. So there has to be a sophisticated, complex multidimensional matrix that looks at these issues, you know, as they appear and that you all now have developed a certain assurance that these issues have been addressed. And when they address in this different fashion, even if it's a change in pressure or temperature flow conditions geometry, some of the generic phenomena are the same.

And I hope that -- Dr. Wallis is agreeing with me in this respect.

And so there is a propagation of knowledge that needs to take place that saves us not only time, it solidifies our knowledge of the previous issue. So there's a growth that needs to take place to be able to consolidate and reduce the amount of work and how decisions are made.

I want your comments on that.

DR. BONACA: That's the way we have viewed AP1000, for example. I do believe that we are relying heavily on current knowledge of certain issues. And I think that the issues that we are dealing with are somewhat unique to the fact that you have gravity-driven safety systems and smaller delta P's and things.

You might want to elaborate on that, Tom.

DR. KRESS: Well, I think the suggestion is an excellent

one. And a good place in my mind to start would be to examine the thought process that went into IRIS, because that's basically what they tried to do.

CHAIRMAN DIAZ: There's a commonality of phenomenon that we need to play into to make them better, to make them solid so we can rely on them. I think this falls right on the type of work that the Committee, you know, should really be looking into. I mean, I know you are.

DR. KRESS: But I don't think we had in mind doing a systematic look at that and documenting it. I think that's a good suggestion.

CHAIRMAN DIAZ: Thank you.

I think, Mr. Sieber, talking about issues of materials degradation. Do you think that one of the issues that we are seeing with cracks and the fact that vertical versus circumferential is becoming more, quote, higher in the risk scale, is because it's more of them or not because they are more dangerous?

MR. SIEBER: Well, I think from the standpoint of reactivity insertion accidents in PWRs, I don't think that amounts to much of a delta risk because plants run with the rods out any way. So if one control rod separates and it's ejected, it does not amount to much of a change in reactivity.

The larger issue is the potential for a LOCA, which will probably be a medium LOCA. And either way --

CHAIRMAN DIAZ: I mean, we are seeing more vertical than circumferential.

MR. SIEBER: Absolutely.

CHAIRMAN DIAZ: Which we are very happy for I should say.

MR. SIEBER: Yeah, but perhaps I don't share your joy because any crack -- none of them are any good.

But from the standpoint of risk, I don't think there's a lot of difference.

CHAIRMAN DIAZ: I think you mentioned at one time the importance of NRC/industry collaboration. And I would like to, for the record, express my support for this area because I think that sometimes we have been very much concerned that we are an independent agency and how we collaborate.

But I think that the fundamental objective is safety. As long as that objective is kept clearly ahead and we have independence of how the results are interpreted, there's a tremendous amount of benefit from this collaboration.

Would you care to comment on that?

MR. SIEBER: I support what you are saying 100 percent. And I think that it makes sense from an economical standpoint in the fee basis to have as much corroboration as one can have.

But I also agree that the analysis of the data should be independent because the agency should develop its own independent

positions on the facts that it learns from tests and experiments and industry data.

So I support it 100 percent what you are indicating.

CHAIRMAN DIAZ: Talk a little bit about the pro-active material degradation assessment. Of course, I am extremely interested in this. Several months ago I already called the staff and said, what the heck are we doing in this area?

I think this is an issue that we need to get our hands around. This is not an issue that we can just passively -- so I like the word, pro-active. It makes my heart get a little warmer.

MR. SIEBER: Well, pro-active implies no surprises, which I think would do us all --

CHAIRMAN DIAZ: Or as little as possible.

MR. SIEBER: That's right.

CHAIRMAN DIAZ: So I think this is an area which I certainly encourage. And I believe my fellow Commissioners have done so also, that we need to really, you know, work on this issue because it represents an area where safety essentially is present every time that we look at it.

And, again, it needs to be looked at in the proper perspective. Again, not all safety issues are born equal. And eventually, we don't want to treat them equally.

So you feel that this pro-active material degradation assessment program is being properly set? Are there any issues in

there that you think the Commission should look at a little closer than others?

MR. SIEBER: Well, we have only had a one-hour presentation so far. And that was yesterday.

On the other hand, my experience is operating experience. And so I represented a licensee. And because of that, it seemed to me that my life would have been, for 40 years, a lot easier, had I -- had we in the industry and the agency had a more pro-active, larger scope materials management program.

And so any step in this direction I personally would support, having lived the life of reacting to issues as they came along.

CHAIRMAN DIAZ: I certainly share your opinion.

Dr. Shack, let's go to the ROP. I think that you said some interesting things.

Talk a little bit about, you know, this issue of balance between performance based and risk informed. I think they are both important, however, which comes first sometimes seems to be the issue.

I think that we need to realize that risk-informed regulation is a tool we are trying to use in many cases. Performance based, you know, it's really a more outcome oriented, you know, a little closer to what you are doing.

Go again over how you would balance the performance based aspects of the indicators versus the risk informed.

I ask hard questions.

DR. SHACK: It was easier for us to decide what was wrong with the way that the risk-based thresholds were chosen than it is to propose the way in which they should be done on a performance basis.

CHAIRMAN DIAZ: Well then, I think the staff is gratified to hear that you realize how tough it is.

DR. SHACK: Again, we were posing a problem. You know, we wanted the staff to come up with a solution. I think the way the green-white thresholds were chosen, it seems to me, is an excellent -- you know, that we have come to a consensus that performance is good and basing the measures on that.

So I would think that we would be looking for an extension of that idea to come up with thresholds. And, you know, it would rely on a consensus and a judgmental process.

But again, the performance indicator is not trying to set up a safety ranking. It's looking at performance. And I think that doing it on a performance based is a perfectly reasonable way to look at performance. We are trying to detect performance anomalies long before they become safety issues.

CHAIRMAN DIAZ: It might be an issue of order of what you do rather than what you do or do not. In other words, which comes first, the chicken or the egg?

DR. SHACK: We believe that the ROP is risk informed in

the sense that it focuses on issues that are obviously important to risk. It's really a matter of whether we can sensibly accept the thresholds on a risk basis when we are only looking at isolated indicators which are only meant to trigger our interest in someone's performance.

And therefore, the focus should be on performance rather than the risks for the thresholding.

CHAIRMAN DIAZ: Let's go to cross-cutting issues and corrective action program now.

I remember, five years ago -- gosh, time goes by -- we were talking about the ROP. And I was making a very strong case that cross-cutting issues were an indispensable component of this program, that without them, the program would actually have problems.

So I completely agree that, you know, the way we deal with cross-cutting issues, especially with the corrective action program, is actually not only necessary, it's almost an indispensable component of how we deal with our oversight and our monitoring.

In this case, you propose some performance indicators. And of course this might get into the issue that it's sometimes a little bit difficult when you are talking about safety culture or whatever you are talking about. But there might be some ways in which we can, without being intrusive into the management structure, which I am opposed to, to clear up what are some of the special attributes that need to be maintained in the corrective action plan?

Would you care to comment on that, sir?

DR. SHACK: We haven't come up, as I said, with specific things. We know that the corrective action program is the core of really where we want to look.

One of the concerns we have is that the different licensees treat corrective action programs in different ways. And so developing a performance indicator could be somewhat intrusive in the way that either you somehow have to interpret information out of different systems or you have to compel people to pick a common treatment.

But as I say, we think that that's something that -- it really will take some effort, I think, to come up with a good performance indicator and a way of measuring performance in the corrective action program. But it's something that does deserve that kind of attention.

And we believe that, you know, doing this will certainly, if anything, increase the attention on that program. And that's from our point of view it's important.

CHAIRMAN DIAZ: This might be an area where really a strong and focused effort with the industry and your participation might be a good thing to do.

All right. Let me go to PRA quality. Of course, it's the issue that is close to my heart.

I remember when I was young and foolish many years ago, that I thought that, you know, we could actually go much faster into the issue of PRA quality. I have now reached more maturity. Not

that I'm getting old but I'm maturing. And I really am becoming programmatic in this issue, that the fact that we really need to get an approach that would eventually reach a vision that I think we all shared, that, you know, we will have eventually all of the tools necessary to actually conduct our, you know, not only the work we do with the licensees.

But we are faced now with the facts of life, that we need to do this in stages. And the issues are, what are the best stages that we can go? Because I don't think that it is appropriate to say we are going to do this; it might have counter effects in that people realize that by going this way is not only the cost of doing the PRA but it's what comes on the tail of it once you do it that could be costly.

Tom, are there any thoughts on a phase program? Have you ever thought about, you know, going with that vision? Is there something that you see that we now have that we can progress rapidly?

Because I believe that the Commission, in fact, in many occasions in here have expressed the fact that we all believe that we should, you know, focus and improve the quality of the PRA. But we now are faced the fact that it needs to be done in a manner that achieves what we want to achieve.

Are you coming from the vision down, which I shared the vision? But, you know, do you have any concrete recommendations from your experience that might help us?

DR. KRESS: I do have some thoughts on that. I don't know if the rest of the Committee or even George himself shares these thoughts.

CHAIRMAN DIAZ: For the record, you are speaking for yourself.

DR. KRESS: I'm speaking for myself.

I think it would be relatively easy to incorporate seismic issues into the PRA at the moment. So we could think about getting those in just the way we do with the rest of the events.

I think it's much more difficult to do the fire. We are working on how to do that. So I would put that off and continue with the process of making judgments and bounding analysis for fires.

Low-power and shutdown risk is, in my mind, the most difficult part of completeness. And we have some ideas from what has already been done that it probably doubles the risk which in PRA space, to my mind, is not very important.

I think the importance of having that in the PRA falls into where you get the risk insights and how you deal with the risk important systems and components rather than the actual contribution to risk.

So I think it's important that we consider low-power and shutdown risk. I think it can be done separately from the PRA. Because what I'm looking for are risk insights and effects on risk importance. So I'm not real concerned that it's not in the current PRAs, although some of the members appear to be, with respect to

uncertainty.

We really have a good handle on how to do parameter uncertainty. It's done quite well and is very useful to us.

The model uncertainty, I think there's enough common grounds in how models are treated in PRAs across the board that it might be worthwhile to just have a one time assessment of model uncertainty and apply that across the board so it doesn't have to be re-evaluated with every PRA. And I think that may be a way out of dealing with model uncertainty.

And then I would use that on the decision end of the process. I would have my risk-informed acceptance criteria, whatever they are, have this uncertainty built in there rather than in the result of the PRA itself.

I think there are ways to deal with this in a phased manner. The one that worries me most right now is how to factor in a fire PRA into the system. I don't even know how to -- other than screening it out as not very risk significant. I don't know how to deal with it.

CHAIRMAN DIAZ: Well, this is why, I think, we cannot achieve the vision until we have achieved some results.

DR. KRESS: I don't think it's something we can get right away.

CHAIRMAN DIAZ: Let me just make a comment, I do believe that the incorporation of operating experience, that is significant

in a way you have to make a --

DR. KRESS: That should be relatively easy to do. It will take some effort.

CHAIRMAN DIAZ: I think that is a good recommendation.

And looking at a phased approach, if we just at least look at reducing the uncertainty of the model rather than determining what the model uncertainty is, that might be an easier task that you are facing. But I think we have the know-how to start reducing the uncertainties on the model. And that certainly seems to be worthwhile.

I think I'm taking too much time. I thank you.

Commissioner McGaffigan?

COMMISSIONER McGAFFIGAN: Thank you, Mr. Chairman. I will probably end up on PRA quality but let me run threw some other things first.

I'm first going to complement you on what was really your initiative with regard to the review standard for extended power uprates. You sent us a letter on September 24th basically saying that the standard that the staff has developed at your request is a good one. We commend the staff for the development of an excellent review standard. This is the teacher commending the pupil for being a good pupil.

The one thing that I noted in the letter -- and I didn't have the old letter here. I forget which one of you had concerns about it. But you end up also saying we agree with the final staff position that

integral system transient testing should be performed unless licensees can provide an adequate justification for not performing them.

I know in one of the early power uprates -- and as I say, I forget which one of you raised the issue -- you were quite concerned that that issue hadn't been dealt with very well. So we are going to have it routinely dealt with in the future. And I think that's a good thing.

I'm sort of just going through some letters here. And one of the letters we got had to do -- well, I think it is this general area of materials degradation. There were additional comments from Dr. Powers and Dr. Kress in this particular letter that suggested the following:

"There are great needs for innovations and technologies for more convenient inspection of pressure boundaries, higher probabilities of detection, better characterization of flaws and cracks and indications of crack growth. These needs for better technology extend beyond the nuclear community into many, if not most, industrial areas. The NRC should join with others to solicit and stimulate the government and private sector to innovate more useful methods for the inspection of metal structures."

I would like Dr. Powers to elaborate on this. And do you have any sense the staff is doing this?

I mean, this strikes me that you are exactly right, that this is an issue that goes far beyond the nuclear community in aviation and space, and whatever. But do you have any sense that this is

happening?

DR. POWERS: We were told explicitly in our briefing yesterday on the pro-active materials degradation program that they were exactly soliciting other sponsors, funding agencies and whatnot to approach this issue of materials degradation in general and inspections and diagnostics as a specific item.

The answer is yes.

COMMISSIONER McGAFFIGAN: So we could envision some day a sort of coordinated DOE and NASA, NRC -- the other guys have a lot more money. DoD, I would love to be piggybacking them and having them do --

DR. POWERS: I think -- I mean, I have this sense that you are going to see certainly agencies like the Department of Energy paying a lot more attention to this materials degradation issue in existing plants certainly as the nuclear industry begins to pay more attention to it as a national issue. It's an unbelievably big issue in this country, materials degradation. I mean, it's multi-billions of dollars.

Certainly we see more coherent approaches being taken to it to Japan as a national issue. So I'm hopeful. I'm not so hopeful as to saying you are going to see a revolution tomorrow in this event.

CHAIRMAN DIAZ: I'm going to make a comment on that. It is a large issue. And I was very fortunate to be able to discuss this at length with the Presidential Science Advisor. It has become an national issue.

And I think that what we should do is make sure that we play in this issue because it's bigger than us. But it is, hopefully, going to be addressed.

DR. POWERS: As I see the challenges that are arising in our nuclear plant inspections from the interpretation of signals that are, at best, crude, as compared to what we might hope for and the attraction areas, the diagnostics are pretty much technology independent. It doesn't matter whether you are diagnosing steam generator tubes in nuclear power plants or stripes on bridges. What you are looking for are flaws in the materials --

COMMISSIONER MCGAFFIGAN: Wings on airplanes, whatever.

DR. POWERS: Well they are looking at aluminum.

COMMISSIONER MCGAFFIGAN: I do think that this is a useful area. I would hope that the Mr. Marberger, through the National Science and Technology Council, would have an initiative in this area at some point because I think it would meet the needs of multiple agencies and prevent multiple agencies from inventing, you know, the same thing over and over, paying the same contractor for doing the same work.

COMMISSIONER MERRIFIELD: If I could beg the pardon of my fellow Commissioner. On a completely different topic. I had mentioned to the Chairman I have a long-standing appointment that was scheduled before this meeting was scheduled that I have to

leave for. And I don't want anyone to take anything wrong about that.

I am always quite interested in what the ACRS has to say. And certainly, my staff will remain and I can certainly take a look at the transcript.

I regret I will also miss Commissioner McGaffigan's questions about PRAs which I'm sure will be quite informative.

That notwithstanding, I do apologize and certainly want no ill harm be taken from that.

Thank you, Mr. Chairman.

CHAIRMAN DIAZ: Thank you.

COMMISSIONER McGAFFIGAN: I'm working my way towards that issue. There's one other letter we got recently, September 22nd. It's a straightforward letter. Your recommendation is Revision 1 to Reg Guide 1.53, application of the single failure criterion to safety systems should be issued.

But the discussion that follows raised, for me, a sort of generic issue. This old Reg Guide from, I guess, June 1973, 30 years old, referenced an obsolete IEEE standard that's gone through multiple revisions since. Finally, I guess, in the latest Reg Guide we will cross-reference the latest standard and not the obsolete standards.

But how much of this stuff do we have in other Reg Guides? I mean, how much of this is lying around where we have these Reg Guide revision zeroes from before the Commission existed as a separate Commission lying around that haven't been kept

up-to-date? Because the industry has to keep things up-to-date. They keep revising IEEE, ASME or whatever standards. We don't ever get around to endorsing them.

Is there a generic issue here? Or is this just a rare exception to otherwise good practice on the agency's part?

DR. BONACA: I don't really have an answer to that question.

COMMISSIONER McGAFFIGAN: See, I ask good questions, too.

CHAIRMAN DIAZ: We should get an answer to that.

COMMISSIONER McGAFFIGAN: Well, at some point, we should ask the staff that question.

DR. SHACK: The answer is there's lots of obsolete Reg Guides out there.

COMMISSIONER McGAFFIGAN: Lots of obsolete Reg Guides out there. OK. Thank you.

The September 30th letter that Commissioner Merrifield raised some questions about that is related to generic safety issue 191. As I read that letter, you know, one of your bottom line conclusions -- I think it's a very good letter. But one of your conclusions is that the staff should consider the possibility that the uncertainties associated with the calculational methodology may be so large or that strainers may prove to be so susceptible to debris blockage that alternative solutions may be required to ensure long-term cooling.

I found that, you know -- I mean, in your next recommendation says the staff should investigate a risk-informed approach. But if the uncertainties are so large, I guess -- you know, Dr. Kress will say risk-informed approaches can be used exactly when uncertainties are so large.

But at some point, we have to fish or cut bait on this. You all sent us a letter back in September 14th, 2001, two years ago, saying we agree with the staff, that the potential issues associated with the performance of pressurized water reactor containment sumps have been identified, the NRC staff should expeditiously resolve GSI 191. If plant specific analyses are required as part of the resolution guidance for performing these analyses should be developed.

Now, this letter, two years later, says the guidance that you are endorsing, Reg Guide 1.82, is pretty good but has some flaws in it and still may not be good enough for a variety of reasons that I won't try to read into the record here. So we are not exactly converging on a solution here.

DR. BONACA: I think we introduced the thought even in the previous letter. If you go to the back in the discussion we pointed out that there is a possibility that the issue of, you know, installation and debris may be un-tractable.

COMMISSIONER McGAFFIGAN: That's the February 20th letter?

DR. BONACA: Right.

COMMISSIONER McGAFFIGAN: That's the one letter I don't have here in front of me.

I have been trying to get caught up on GSI 191. I have read some of the staff analyses from the 2001 time frame. And they basically -- as Commissioner Merrifield elicited from Dr. Wallis, they basically are talking about maybe 31 out of 69 plants with the range from 37 to 25 might benefit from a regulatory action.

That regulatory action might result in something on the order of one times ten to the minus four reduction in core damage frequency. And they basically say -- and the thing that they use is either larger strainers or better material control and containment or both. And also there's active strainers and all that sort of thing.

But they come to the conclusion in September 2001, one of the staff doing this cost benefit analysis, that this is probably cost beneficial, especially taking into account license renewal and the fact that these plants are likely to operate for an extra 20 years, the vast majority of this.

So we bit the bullet on BWRs. Took us a while to do it.

If you were a betting man, would you say that a year or two from now we will just be putting out guidance that, you know, this is pretty hard stuff to calculate, you can -- and if you want you can do a cross lead plant specific analysis that takes into account all this stuff? Or you can get us an extra margin here by increasing the size of your strainer. Are we like that?

What is the likely resolution whenever we finally bite the bullet?

DR. WALLIS: I don't know if it was in this letter or if it was in an earlier draft I think we said -- as a betting man you -- this isn't the committee's bet. The earlier draft said, if employed, that we expect that PWRs will have to do something like what BWRs did.

In terms of the question about whether or not it's tractable -- you know, the real purpose is long-term cooling. It's not sump blockage. If there is a better way to cool a reactor in long term, that's fine. The sump pump is less important.

I would like to defer to Dr. Kress on that particular paragraph.

DR. KRESS: We did agonize over that paragraph. I was responsible for getting that one in there. I will have to plead guilty.

I looked at -- the Reg Guide says you will determine sources of debris and calculate how much gets to your sump and what effect it has on the pressure drop and the net positive suction head to the strainer and we'll adjust things to meet the design basis accident requirements of long-term cooling.

When we looked at the phenomenology based on how to calculate the effects of the blow down on creating debris and how to move that debris around and how it ends up on the screens and how it effects the flow through it and the blockage, we really thought that that phenomena base was un-tractable. It just was not -- it's too big of an

uncertainties and we didn't have enough database. We really were not going to be able to calculate that.

COMMISSIONER McGAFFIGAN: That's what most of the letter is about for those who have not seen the letter in the audience or whatever. You talk about how difficult it is to figure out what the zone of influence is and how this Los Alamos report is incoherent in several places where there -- they refer to different things.

DR. KRESS: And there were so some real hokey things about the zone of influence also.

But when we looked at that situation, we found it was going to be very difficult to say what size of strainer you need. That's the question you are going to come down on, if you are going to do the BWRs, how big of a strainer do you need.

We didn't think you would be able to even come to that conclusion.

COMMISSIONER McGAFFIGAN: You can always come to a conclusion. How strong does the bridge need to be? Well, I'm not quite sure but we will make it stronger.

DR. KRESS: I think it's going to come down to that kind of judgment. There will be some size that people will agree on that's probably alright. I think the way to arrive at that size of strainer is using our risk-informed procedures. Because the probability -- here now it is important to know what the probability of break sizes are. Because the smaller this break, the less that debris is going to get there.

You can use a risk-informed process to say, okay, we know enough that risk informed -- about the probability of break sizes that we can -- we don't have to deal with the double-ended guillotine break for in-line strainer. That will give you a way to, I think, approach a reasonable strainer size to get us out of this problem.

COMMISSIONER McGAFFIGAN: I have not mastered these documents, but I will tell you the staff analyses were using probabilities for medium, small, large breaks. They were trying to be relatively risk informed as they were doing the analyses that I think you all saw in the 2001 time frame. I don't think double-ended guillotine breaks contribute very much to this. It's the smaller stuff that's more likely -- that's still causing potential sump screen problems under this analysis at some of the plants.

Okay. PRA quality. I commend you for laying out the vision that you have laid out. I think that the Commission, in its various SRMs in late March, bought on to that vision to some degree. We are getting a fair amount of push back from the industry. And I think we recognized at the time that there would have to be a step-by-step process.

But it is, as I said in my vote at the time, sort of discouraging that Dr. Rasmussen recently passed away but it's been 28 years or something since his study, it's been 15 years since the AIPE effort was initiated. It's been seven years -- eight or nine, whatever it is since the PRA policy statement. And we are still trying to figure out

how to get our arms around this stuff.

And the industry cries poor. But they really make money hand over fist when these reactors are operating. A mil per you know a 10th of a cent per kilowatt hour would buy the highest quality PRAs in the history of mankind probably for all of these plants. And in all honestly, we have spent probably far more than a mil per kilowatt hour in the last year on the increment for security at the plants.

And we also saved them money. You know, I think we have done one major rule aside from our normal fee rules during the seven years I have been here. That was the rule that allowed for these modest measurement and uncertainty power uprates. I think the staff underestimated, given what we are seeing today when we did the cost benefit analysis the number of plants that would come in for those small 1.4 percent power uprates. But 1.4 percent times, you know -- that's 14 megawatts per plant times a fair number of plants. That's pure profit.

I mean, and we estimated at the time that that rule was probably a major rule. It was probably more than \$100 million a year benefit to the industry.

I'm very sympathetic to Dr. Kress's point that the staff on every application today, using Reg Guide 1.174, has to make this judgment about is this PRA good enough for the application. Rather than making one judgment about whether this PRA is good. Each time, theoretically -- I'm not sure how we do it -- is this PRA good enough for

this application. And then we go and apply it.

Then we have these criteria for, like you say, depending -- we have this famous graph in 1.174 that pretends we know what the total CDF is. And we are propagating that in the guidance on 50.69 where we are, again, pretending to know.

And I asked the staff and it isn't really the total CDF. It's the internal events full power CDF that they want to be less than 10 to the minus 4 in order to have -- I think it's what the word significant means in that particular case.

In your latest letter, though -- let me ask a specific question. You said -- you raised two issues, one of which the staff says we are going to kick down the road model uncertainty. The other of which was incorporating operational data.

And from your latest letter, your September 22nd letter, it implies the staff sort of may have helped fix something in draft guide 11.62 with regard to incorporating operational data.

Is that true? Have they really solved your problem there?

DR. KRESS: I don't think I'm familiar enough with what's in that Reg Guide.

Can any of the other committees help me on that one, members?

I know they discussed the need for --

COMMISSIONER McGAFFIGAN: How do we get them to do that? I mean, as you say, the ASP program, a fair fraction of the

precursors are not modeled. If a member of public will say, gosh, if the precursors aren't modeled, then how good are these models? David Lochbaum has exactly said that.

How do we get them to incorporate the known knowns from a quarter century of industry experience into their PRAs?

DR. KRESS: Once again, this is a case where we raised the problem and passed it over to staff and you tell us how to do it.

DR. BONACA: Having been on the other side and responsible for a PRA program for many years, and we were aggressive with that, unfortunately with the industry -- I mean, any time you have the need for a new LOCA analysis, it costs a significant amount of money if you went to best estimate, very much money, comparable to large pieces of a PRA.

Nobody ever even questioned that. You need to do it. There it is because it's part of the design basis.

But there was a mind-set in the industry that since you do not need it for your licensing basis to have the PRA, therefore, you don't want to invest in PRA. I'm being frank on this. This was the mind-set. And it comes easy because clearly you are wrestling with budgets. And you want to contain costs. That's a legitimate objective.

So it's a very hard thing to do. Now, I'm thinking about other plants for which we expect them to have a PRA. And that mind-set will disappear. Because, I mean, they invest in the money. It's an expectation.

COMMISSIONER McGAFFIGAN: I suspect if we ever do build a new plant in this country, it's going to have an entirely different regulatory philosophy that there will be living PRAs, there will be high quality PRAs --

DR. BONACA: One of the things that is important --

CHAIRMAN DIAZ: I agree with Commissioner McGaffigan on that point.

COMMISSIONER McGAFFIGAN: But the question is we have got a bunch of plants that are going to operate for another 40 to Watts Bar 50 years. And how do we get -- should we be requiring something with regard to inclusion of operational experience? You know, if you are going to send us a PRA in and use the PRA or you are going to use the PRA to justify a license amendment, we are going to ask you every time hard questions about whether this PRA includes all the ASP events. And if it doesn't include ASP events, we can't use it.

I'm sure people would say that's horrible and you can't do that. Maybe the Chairman is about to do that. I may be simpleminded, but I'm looking for something that puts pressure on these guy to do the right thing, to keep their PRAs up-to-date, viable documents or they don't get the benefits of risk-informed regulation.

That's a discussion that we will have for a long time around here.

CHAIRMAN DIAZ: I do believe that we have some tools that we can use to make sure that the right emphasis is used.

COMMISSIONER McGAFFIGAN: That's all. There are not many questions in that. More a soliloquy.

Thank you, Mr. Chairman.

CHAIRMAN DIAZ: Thank you, Commissioner McGaffigan. Of course, this is an issue that we are debating right now. We realize the importance of the resolution of a quality PRA.

I will just make a comment. I keep repeating myself. But we need to be careful of how we use PRAs and all of these issues when you put them together. You know, if the model is only good to one significant figure, then you might as well go and fix the problem because you are not going to get any better. Sometimes we start to argue about different things and it's really not worth it.

DR. KRESS: You don't want to forget defense-in-depth.

CHAIRMAN DIAZ: That's right. Well, I want to thank you for a good meeting. You know, I'm sorry that I missed, you know, some of my old friends in here. I don't know where they are. I was hoping to be able to joke about it. I'm not even going to mention their names but they are Greek.

I think we had an excellent meeting. You can see the interest of the Commission. We look forward to continue working with you and for your continued support.

This meeting is adjourned.

(Whereupon, the meeting
was adjourned at 11:25 a.m.)

