UNITED STATES NUCLEAR REGULATORY COMMISSION

+ + + + +

MEETING WITH THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

FRIDAY, OCTOBER 20, 2006

+ + + + +

The Commission convened at 2:30 p.m., Dale E. Klein, Chairman, Presiding.

NUCLEAR REGULATORY COMMISSION:

DALE E. KLEIN, CHAIRMAN

EDWARD MCGAFFIGAN, JR., COMMISSIONER

JEFFREY S. MERRIFIELD, COMMISSIONER

GREGORY B. JACZKO, COMMISSIONER

PRESENT:

DR. GRAHAM WALLIS, CHAIRMAN

DR. WILLIAM SHACK, VICE CHAIRMAN

DR. GEORGE APOSTOLAKIS

DR. MARIO BONACA

DR. THOMAS KRESS

P R O C E E D I N G S

CHAIRMAN KLEIN: Well, good afternoon. I am pleased to hear from the ACRS today. I should note that Commissioner Pete Lyons would have liked to have been here. He is with Jack Marburger in China on a trip. Obviously, Pete has had a long interest in activities of the ACRS.

We all appreciate the hard work that you have done, and I have looked at a lot of your reports in my almost three and a half months here. Three months and 20 days, but who is counting. And you've really helped us a lot with a lot of your activities.

And one of the comments that you have made that I certainly appreciate is the fact that the Commission needs to give clear guidance. I think it is very helpful to those we regulate if they know what our requirements are, so I appreciate those activities. So it is very important on what you do.

So today we are going to hear about several activities, including the sump pump, the Safety Research Program, and the Early Site Permits and some design activities. And so I look forward to hearing your comments. And then, as always, I'm sure the Commissioners will have a few questions after your presentation.

Any comments from Commissioners before we start?

COMMISSIONER MERRIFIELD: No, the only thing I will say, Mr. Chairman -- I'll leave it for Chairman Wallis to do the formal introductions -- but I would note we do have a couple of new members of ACRS with us today, and I certainly would want to express my welcome to them. It is an August body you are joining and we appreciate the high quality you are bringing.

COMMISSIONER McGAFFIGAN: Mr. Chairman, there is one thing I neglected to do looking at the back; this is probably Mr. Larkin's last meeting. And I do want to compliment him for the efforts he has put in, supporting these people over a great many years. I think of my entire ten years on the Commission, you have been backing these folks up, so we should note that.

CHAIRMAN KLEIN: Thank you. Graham.

DR. WALLIS: Thank you, Mr. Chairman. Before I get into my presentation, this is the first public opportunity I have to congratulate you on your appointment. On behalf of the ACRS, I would like to do so.

CHAIRMAN KLEIN: Thank you.

DR. WALLIS: It was mentioned that since our last meeting, we have a couple new members. Actually, we have five new members since our last meeting: Otto Maynard, Sam Armijo, Sanjoy Banerjee, Michael Corradini, and Said Abdel-Khalik. So we have five new members, which is almost half of our complement. So some of us who are older are looking forward to the younger members taking over some of the job.

CHAIRMAN KLEIN: That's scary when you refer to Mike as young.

DR. WALLIS: I think he is a little scared too.

COMMISSIONER McGAFFIGAN: And you are also going to be expanding as we get ready for bough wave of new applications.

DR. WALLIS: So let's get on with the presentation. You all have the slides, so I will refer to them. You will note on the first slide that since our last meeting with you in this room, we have not been idle, and we produced 37 reports, which is sometimes called letters since we met last time.

The slides, a few of them here mention several of these topics. There are too many to mention all the slides. The ones that have been selected here are mostly on the basis of their contribution to the regulatory process. That was the basis for selection. And I will be, in fact, even more selective, because I don't intend to discuss everything that is on the slides either. And several of these are subject to more detail presentations later anyway.

So let's look at the first slide. On slide three below the number of reports, we have completed two early site permit applications. We have actually completed -- we have actually considered three in all, but these were two. This has gone pretty well as proceeded, pretty straight forward. There don't usually seem to be many issues. We raised a couple of issues in each case here, relatively minor ones. My colleague, Dr. Shack, will present some lessons learned from this experience later in the meeting.

I would like to move on the next slide. Sump strainer matter was mentioned as being the subject of several of our meetings here. Hopefully, it is now coming closer to resolution and completion. I will say more about that later. I have a presentation coming up when we finish with this one.

Move to the next slide. I want to pick up the bottom item on this slide, number five, which is the safety culture issue, which has been raised from various sources are. The staff is handling this as part of the Reactor Oversight Process. They already have a process in place and they are expanding it to take account of safety culture. We agreed that this is the right way do it and that they are approaching it appropriately. So we agreed with what they are doing on this matter.

On the next slide, after two years, we write a report on the NRC Research Program and are also now getting involved in doing some reviews of individual programs, but this is the big report on all the entire research programs. This is referred to here. Dr. Bonaca is going to say more about that later.

If we go to the next slide. This says lower -- the lower slide in here, digital instrumentation and control system. This is an important thing. There is a transition -- inevitable transition to digital instrumentation and control that is taking place in many nuclear plants.

We actually heard today of some interesting things that can happen when it goes wrong in this meeting we have just come from. The Agency is developing methods for assessing and evaluating the reliability and safety of such methods. We looked at their program and said that's okay, but the results are pending. We don't have the results yet. This is an important matter.

If we go to the next two slides, which concern license renewal, we have been renewing licenses for some time now. Licenses have been renewed in about half the plants. It is developed to the point where for many plants it is a very straight-forward process. There is a template which is followed, and those that are well-prepared don't really have much trouble getting through the ACRS.

So when they are well-prepared, we can manage to reduce our number of subcommittees meetings maybe to one, which is really the minimum. We have to have a meeting. If we can reduce it to one, then, that's a good sign. And this happens when the applicant and the staff are well prepared and there aren't any technical issues, matters.

We did raise a new question -- I don't think it is a very serious one, but it is important for completeness on slide nine, the matter of phosphate iron concentration and ground water. The staff has given us a preliminary response to this matter, which seems to be going toward resolution, but they have not yet given us a final answer.

The Palisades application on slide nine, the staff asked to us move that up from our December meeting into November. We obliged, so we are accommodating their accelerated schedule for that. And we are in the process of reviewing Oyster Creek, which is also noted on this slide, which is an interesting one.

On the matter of power uprates, again, this is something which we have now learned how to do. Both we and the staff developed a process that I think is about as streamlined as it can be, as was the case with license renewal. Occasionally, technical issues do come up.

For instance, as you are aware, at several of the BWRs and Vermont Yankee that is mentioned on this slide is a matter of steam dryer cracking and what measures are taken to monitor that and avoid it; and there is also the matter of containment over pressure credit, which is an ongoing one.

We can move on to 50.46. We plan to review the draft final rule next month. That's on our schedule for a couple of week's time. Before we review the associated Reg Guide, which some of us think is an important part of the whole package, we have to get it from the staff.

Future activities listed on the next couple of slides. This list always looks about the same as the year before with a few changes. So I would like to concentrate on the changes. Design certification.

Advance reactor design certification. This is a major activity. Design certification involves many subcommittee meetings. By many, I mean, 10 to 20. It is a big -- to go over all the technical details; and a few full committee meetings.

This is an area -- we see as a significant area of responsibility for us. It is probably our major contribution to licensing of new reactors. We concentrate on the technical reliability of the safety systems; that is our contribution. And then other matters are licensing. We don't have so much to contribute to, but if we can do the technical side, that's where we concentrate.

Combined license applications. We have been warned that somewhere in the future, there will be a lot of those. And the number that's mentioned seems to grow almost daily, it seems, or maybe it's weekly or monthly, but it grows. We are working with the staff to figure out how to handle this. Dr. Kress has something more to say about that later.

On some of these other matters I have already discussed or will be discussed by my colleagues. On 14, there is a new job that's been given us recently, the top item on slide 14. We have been asked to review many Regulatory Guides and related Standard Review Plans for new reactors.

We have said in previous meetings with you, some of these Reg Guides have not been looked at for a long time. And so we have a huge pile of Reg Guides to look at. We are working with the staff to figure out which ones we really need to look at, and we have done some, and it has worked out well so far.

It doesn't look as if it is going to be as big a chore as it might have been. So, we have got some experience and I can give you so far a good word on that. I just mentioned in the --

COMMISSIONER MERRIFIELD: Can I ask a clarifying question on that one. You said the Reg Guides are not nearly as big a chore as you expected. I take that to mean that the staff is doing a pretty good job?

DR. WALLIS: That's right. Some of the changes actually are so minor that we don't need to review them. You know, so far, but we have not done them all yet. It looks good so far.

I note in the middle of this slide, we are involved with safeguards and security matters. That was the new job a little while ago that we took on as well as our other work. I just mention it here. It is not a subject for public discussion. I just bring it to your attention that we are doing that. I think that's about all I have as a way of introduction and overview.

If you have questions, we can handle them now or we can -- we usually just go ahead with our presentation. Whatever you want to do.

CHAIRMAN KLEIN: Why don't you go ahead, and we will save our questions until the end.

DR. WALLIS: I will do that. The next matter is also mine, and that is PWR Sump Performance. On the first slide -- on the title slide there is a picture to sort of remind you what we are talking about. In the event of a LOCA, a lot of energy is released, that can strip insulation and other materials from the structures in the building and from the building itself. They fly around the building. They mix with the water so they get washed down to the bottom of the building, some of them any way, and they accumulate in the bottom of the building.

And later on in the process when one runs out of water, wants to conserve water from other sources, this water is recirculated to cool the core. When you recirculate the water, you want to have it clean enough. And you also do not want it to clog up the pumps and so on, so this water is cleaned by going through a sump.

And on the right here, as indicated that there are several ways to clean it. The debris curb to catch the big debris, a trash rack over the core system to catch the major debris. And the screen or strainer, it is now called, to catch the smaller stuff. So what goes to the pump is clean enough to be recirculated to the vessel. Now, we have talked about this with you several times before, so I will just go over the newer items.

Earlier this year, we met with the staff and NEI. And what we really heard there was their plans for resolving the issue. Later in the year, we met with strainer vendors. And for the first time we got some details of just what these new strainers would look like. So we saw what they would look like. We heard how they are being tested and we heard a little bit about how they are expected to perform. What changes are the small or outside bigger area and so on, and what plans they have to test them. So we learned quite a bit from them.

And in September, one of us went to actually observe some of the tests of these strainers that the vendors are conducting. So these are the interactions we have had on this matter. We also heard from the RES from the research branch of the agency about the research they have been doing on this.

COMMISSIONER MERRIFIELD: I'm sorry, do you have any characterization of those visits? You said, folks went there and observed them.

DR. WALLIS: We observed them. We observed both the strainer test and the -- we observed the NRR people who were observing the strainer test. That was part of our purpose.

CHAIRMAN KLEIN: Any indications of your observations?

DR. WALLIS: I went there. I can not speak for the committee. I would be very happy to tell you latter today. I think we are going to meet later. I think that is the appropriate place. That will be a much franker discussion. It was very interesting. I think it was good.

The recent NRC Research on slide 17. They are listed here, the usual suspects,

chemical effects, the debris bed structure. The structure of the debris bed effects the pressure drop, rather than just how much stuff is there depends on how it's arranged. Coatings, transport and head loss has been a concern. There a lot of coatings in these buildings if they come off. How do they come off and how do they get transported and what effect do they have on the strainers has been a concern of ours.

We have been concerned about the adequacy of the head loss correlations, and we have -- particularly recently -- raised the question of, well, if you make these strainers bigger and more stuff gets through, what effect does it have downstream? Because, you know, there are things like valves, pipes and a reactor downstream of these strainers, and what happens when it gets there?

We raised those concerns and the staff was responsive in terms of their research. But they are stopping that research mostly now and handing it over to industry, which is on the next slide.

Industrial activities. Well, I have already indicated that industry is doing full-scale tests of strainer modules. What that means is a strainer that is put in a containment building consists of a whole lot of individual modules. Typically, something like a cylinder with holes in it, and just imagine if it is a big colander or something. There may be many of these. I mean, hundreds depending on the design and put in the containment different places and so on.

The approach of industry is to take one or more of these full-scale modules, put them in a pool, put in debris in various forms, flow water through and do enough tests so that they are able to extrapolate the results to explain what will happen -- satisfactorily explain what will happen in the actual real situation. That's their strategy.

They are also doing chemical effects testing. They are doing some work on the fundamentals with smaller scale loops, head-loss correlations. They are doing coating work. I think EPRI is doing work on effects of jets on removing of coating from particularly the containment.

Transport of coatings. Does it make it to the strainer. A lot of these coatings are heavy and they break off as flakes and they fall out, and so on. Debris transport is being investigated, and there has also been some studies of downstream effects, which we have seen. Some of them are theoretical.

And there have actually been some tests where there has been a rod bundle where the

typical debris catcher at the bottom of the rod bundle and the debris has been caught, and the pump's been turned off and it falls off and things like that. So there has been both theoretical and experimental work on the downstream effects, particularly on the core itself.

The path forward on this matter, we addressed in our letter of April. We noted that all PWR licensees who have not done so already are installing larger sump screens, usually of different designs from what they had before.

We thought this was a good idea and it was certainly ameliorate the pressure drop problem and it will certainly help the pumps to function better. So it is going in the direction of resolving the head loss problem and the net positive suction head of the pump's problem, it's doing the right thing there.

As I mentioned in discussing the last slide, the performance of these sump screens is being validated by proof tests, which is putting something like what you are going to have in your plant in these test facilities and testing it over a sufficient range of variables. And then extrapolating from that to what will happen in the plant. This is plant specific.

We had this discussion with the Europeans today. The Germans say, well, all of our reactors are the same, so we can have one sump screen design, so we just need to test one. You folks need to test one of these for each utility or something, not quite as bad as that. But it is a much broader problem in this country. Each utility has control over these tests so they may be performed in Switzerland, for instance, by one of the vendors but what is done there is, I think, specified by the utility. The utility people are there.

COMMISSIONER MERRIFIELD: Mr. Chairman, just for clarification. Obviously, each utility can make their own choice on the sump strainer they want to utilize.

DR. WALLIS: Yes.

COMMISSIONER MERRIFIELD: I was in South Texas this week, and we actually went down and -- I don't want to say inspected, but I got a chance to see the strainers that they are putting in during their current outage. And the design that they are using in South Texas is one that they are using at 18 other units.

So there is -- it is such a wide degree of variation --

DR. WALLIS: It is the same design. Some of the things that happened, for instance, is that in some places the strainer is closer to a wall, let's say, or to some place in the containment that is a different shape than it is in others, even if it is the same strainer. And so there are special tests done, taking a strainer and putting it close to a wall to make it typical of that particular lay out. So even though it is the same strainer, the layout in the plant may be different.

COMMISSIONER MERRIFIELD: I didn't want to --

DR. WALLIS: That's why I didn't want to get into pump specific tests, even though it is the same strainer.

COMMISSIONER MERRIFIELD: I didn't want to leave the impression that there is a different unique strainer at each of the seven sites.

DR. WALLIS: No, no, now -- well, maybe, it is up to the utility. But as you rightly point out, there are five strainer manufacturers -- the strainer from each manufacturer tends to have the same design.

But in the case of, say, the pocket strainers from Switzerland, the length of the pocket may be different. It is the same design, but it is custom made for that plant.

COMMISSIONER MERRIFIELD: I don't want to get in too big a debate here, but if the Germans are going to say that they are all the same, not all the plants in Germany are the same either, so the same issue is there.

DR. WALLIS: This is not a debate; I'm just informing, I hope.

COMMISSIONER MERRIFIELD: No, that's fine. I just want to make sure the record is clear.

DR. WALLIS: Yes, that's clear. And we can -- well, we have some time to go into that more later.

The intent is to treat the formation of the debris and its transport in a conservative fashion, which probably means that much more debris is assumed to get to the screen than in reality will, for example. And industry is performing whatever needed research there is, in addition to all of this.

Now the, last -- I have got ten seconds -- well, it seems to be going up. Am I over my

time?

CHAIRMAN KLEIN: Yes.

DR. WALLIS: Well, it does not matter.

COMMISSIONER McGAFFIGAN: That's what Congress says too. That's the prerogative of the Chairman, tell your colleagues they have less time.

DR. WALLIS: If the message is important, I have to have time to deliver it.

We have been questioning -- and it may have come through in what I said already -- how are you going to go from these tests to predicting and satisfying yourself that what happens in the plant is going to be okay? That's what we have been asking the staff. The staff knows that. They have the same questions essentially that we do.

And we, in our letter, said look, there are still some uncertainties about the phenomena, and if you leave it all up to industry, you might not be in the right position to really evaluate what they are doing. So maybe there are some areas where you really ought to continue doing research. We said that in our letter on August the 1st. Thank you very much.

CHAIRMAN KLEIN: Thank you.

DR. WALLIS: Next we have on the agenda is Safety Research Report, Dr. Bonaca.

DR. BONACA: Yes, I will brief you on the 2006 Research Report. This is the report that we issue every two years. And therefore, it brings about a summary of progress done by Research in the past three years.

In this report, we presented our observation and recommendations concerning the portion of the program that is devoted to regulating existing light-water reactors, as well as certification of advanced light-water reactors. We also provided some observation on the need for research in anticipation of more advanced power concepts.

Observation and recommendation regarding security and safeguards we provided through different letters. There is no mention of that inside this Research report. And the research on nuclear waste issues are addressed by ACNW separately.

In our review of the NRC safety research program -- first slide -- we considered the programmatic justification for the research as well as a technical approach and progress of the work.

In general, we support research that provides support for the identification and resolution of safety issues; develops the capability of the agency to independently review submittals by licensees and applicants; supports initiatives of the agency such as the development of the technology nuclear regulatory framework; improves the efficiency and effectiveness of the regulatory process; and maintains the technical expertise within the agency in disciplines that are crucial, in our view, to the agency mission. Next.

The NRC Research Program is largely focused on addressing near term regulatory needs of the agency. Current activities are very much concentrated in three disciplines: materials and metallurgy, probabilistic risk assessment, thermal hydraulics.

We view this as an appropriate focus of the current safety research program for a number of reasons, but in materials and metallurgy clearly Davis-Besse has emphasized the need for the agency to have a better understanding of the corrosion of metallic systems in the aging fleet of power plants.

The license renewal and power uprate require, in fact, support, and some research efforts in determining aging management program and in assessing margins in plants. Stress corrosion cracking experienced by steam generator tubes in PWRs and systems within the BWR vessel also point to need for further research in the material in the metallurgy area.

The PRA is the basic technology for the risk informed regulatory system envisioned by the Commission. Research activities are focused largely on the application of technology to reactor regulation through the ROP. PRA insights are also essential to develop and implement the revisions to 10 CFR 50.46.

And then, of course, there is a large program of developing the SPAR models, which are fundamental tools for risk informed regulation. So this is another area of concentration of the research activities in the research program.

Finally, the thermal hydraulics is a fundamental feature of safety analysis. And confirmatory review of licensee analysis requires high quality TH evaluation tools. The NRC has consolidated several models in a single code called TRACE. And so all these activities, which are

being conducted, including then the sump screen issue that Dr. Wallis described before, point again, to the need of concentration of effort in the thermal hydraulic area. So this is a good focus of the program of the NRC at this stage. Next.

I would like to point out here what we have viewed in the report as noticeable accomplishments. The progress has occurred despite a diversion of substantial Research talent in the agency to address issues of reactor security. Notable accomplishments are the multidisciplinary review of PTS criteria, the performance of high-burnup fuel during reactivity transients, and the embrittlement of zirconium alloy cladding when taken to high burnup.

We applaud this highly technical effort, but disappointed by the pace with which this important research results are being used to modify regulations, and we have stated so in the report and explained that. Next slide.

The NRC -- previous one. Slide 25. That is support for future licensing activities. Slide 26, I'm sorry.

Yes. International collaboration, I am sorry. The NRC has developed effective collaboration with other countries on reactor safety research. We have noted so in the report. There are two types of collaboration we have seen. One is exchange of information on different topics. The other one is partnering in some research, and particularly, in some tests that have been performed.

We feel that this is very important area, particularly, as we look at the international certification of certain designs. And we believe that there is already extensive collaboration with European countries. We view, however, the possibility for expanding further collaboration with Asian countries which have active nuclear power programs, and we believe RES should pursue this collaboration with Asian countries.

COMMISSIONER MERRIFIELD: So just for clarification, you principally need Japan and Korea.

DR. BONACA: Yes, Japan and Korea.

Slide 26, support for future licensing activities. The NRC advance reactor research resources are properly focused on advanced water reactors, such as ESBWR and the EPR.

Very advanced reactor concepts have not reached a sufficient state of development such

that productive use of regulatory research can be made at this time. However, work should continue on the technology neutral framework for regulation. That would be helpful not only for the advanced generation of reactor later, but even for the coming light-water reactor that we are going to be reviewing.

There are some indications that certification may be sought for advanced design with minimal experimental study of plant response under accident conditions. The NRC needs to provide clear guidance on its expectations for the experimental evaluation of computer models used in the licensing of advanced reactors that do not use familiar technologies.

Opportunities for independent research, slide 27. We have noted in the report that in recent years a strong effort has been made to concentrate research on areas that are supportive of the immediate needs of the line organization. This is appropriate. But focusing NRC research entirely on the immediate needs of the line organizations entails an important risk.

First of all, it reduces the opportunities for independent thought, but also, reduces the opportunities for making more dramatic improvements in the tools that support the regulatory process at a time when there is the rapid increase in work load and improved more aggressive tools can be helpful in that area.

It is important that NRC research stays abreast of technological developments that can enhance safety. Areas where developments in large technical communities, can be important to NRC have been listed in the report. And you may note, we include the reactor fuels, man-machine interfaces, technology for monitoring component performance, inspection techniques, virtual facility inspection.

The main point here is that engineering science outside the NRC is moving towards high powered computerized models that provide also help for integrated analysis tools and are readily accessible to the engineers. Licensees and vendors are requiring some of these capabilities and RES need to dedicate some resources to develop and provide the staff with similar capabilities.

And my last slide has to do with the vision for the future. There is a potential as many as -- many reactors may by built over the next 15 to 20 years. And it is unlikely that the agency resources will see the same level of growth. So it is important, as I said in the previous slide, that some

research be devoted to the development of regulatory infrastructure and tools that support the staff with maybe less experience, but dealing with more tasks.

And we can foresee a time when the regulatory staff will have access to superior tools for system analysis and phenomenological analysis and risk assessment. In that sense, development of such validated and verified tools for routine use by a known specialist will require a research program that is not tied exclusively to the immediate needs of the agency. That concludes my presentation.

DR. WALLIS: Next item on the agenda is the Lessons Learned from the Review of Early Site Permit applications, and my colleague, Bill Shack, will present this.

DR. SHACK: All right. We have reviewed three early site permit applications, North Anna, Grand Gulf and Clinton. And after we completed those reviews, we invited both the staff and the applicants to come back for a lessons learned review, so we could all get together on the lessons that the applicant felt they learned during the application, the staff felt they learned during the review, and that we felt we learned during our review of those applications.

And one of the clear messages one got, of course, is that the good guidance makes applications much easier both for the applicant, for the staff, and for the ACRS. And you know, early site permit, these are the first three applications. The applications and the reviews began without fully developed guidance. And so there is a certain give and take between the licensee or the applicant and the staff. And again, things went smoothly when they had a common understanding of expectations. They went less smoothly when there was not that expectation.

And we will give some specific examples of areas where guidance is needed, but that is a general theme, and again, we have seen that in license renewal, that as the guidance has gotten better, most of the license renewals become easier to deal with and we expect that will be true with combined licensing applications. The better we can make the guidance, the more effectively we can have the applications and the review.

One particular thing that the applicants noted was some difficulty in making electronic submissions. That is -- I mean, this is literally an IT problem. We are not talking about, you know, some fundamental philosophical difficulty. We are down to compatibility of file format and grungy

details, and we will assume that will be worked out, but again, those problems do create difficulties.

One of the other questions that came up was internet data. And in a larger sense, one of the holes in the rules for the early site permit was a kind of an oversight as to whether Part 21 and Appendix B of Part 50 applied to the applications. And so, what quality requirements and what quality assurance did you have to have from this data?

And again, many of the applicants found it convenient to get their data from the internet and the question is how do you apply quality control appropriately for that. And how do you assure that there is a permanent recollection for that record.

Again, when you are dealing with data from the weather bureau, that's one thing. Data from other sites may be a more transitory thing, and again, how to capture that and assure it is in a permanent form.

One of the guidance that the staff had to develop for its own review was when they came to items where they felt they needed a permit condition or a COL action item, how do you decide when there was something that had to be resolved in the application now, something that could be resolved by making it a permit condition or something that could be deferred to the COL. And again, the staff had to develop criteria to do that.

And again, because of the nature of the process, they were developing those criteria as the reviews were proceeding, and of course, it would have been better to have that up front and clear to all the applicants.

One of the new technical issues that came up was for seismic hazard analysis. One of the -- again, these sites all had existing power plants. So they had been reviewed for seismic activity, a seismic hazard had been defined for these sites before, because we have already got existing reactors on them, but that's 20, 25 years ago. Since that time, we have developed new information on seismic hazard and in most cases what it indicates is that the seismic hazard at least in the eastern U.S. has increased somewhat.

This should not turn out to be too significant at North Anna and Grand Gulf and they choose to define their safe shutdown earthquake using the current NRC regulatory guidance for defining the safe shutdown earthquake, the hazard curve.

Clinton, however, I think went through the analysis and felt that the defining an SSE through the currently accepted guidance would lead to a more restricted safe shutdown earthquake hazard curve than they wanted to have. And so they opted to submit a performance based seismic analysis. And again, this was done on the fly, so staff was handed a new approach to seismic hazard analysis as part of the application, which, again, is not a way to guarantee that your application goes as smoothly as possible.

It turns out the performance based hazard analysis is an interesting one. Instead of focusing, as the current guidance does, strictly on the ground motion and defining a ground motion -- acceleration high enough that are you are very unlikely ever to exceed that ground motion -- the performance based one looks at both the ground motion and the response of the structure and defines an SSE such that you are very unlikely ever to cause significant lasting deformation in your structure, which again, assures you that you still have considerable margin toward the performance of your safety function.

After the review, the staff found this, in fact, an acceptable approach; and in fact, they found it a quite interesting approach, because it really looked at it in a more integrated manner considering both the ground motion and the performance of the structure that was going to be built.

Again, much of the other guidance really -- or many of the other lessons had to do with, again, specific forms of guidance. Just what did it need to do to define the site? What particular characteristics had to be considered. These plans went with the plant parameter envelope approach, because they didn't want to settle on a specific design.

Well, again, exactly how many parameters do you need to define a plant parameter envelope? I think there is a sort of general agreement that they probably defined too many parameters. This probably won't be much of a problem in the future, because we expect applicants to be coming in with more specific, I want to build an AP1000, I want to build an ESBWR, and those plant parameters will be better defined.

Again, one of the problems was an option. The early site permit that you only needed to describe the major feature of your emergency plan. Well, what is a major feature? And that was sort of a matter of discussion between the applicants and the licensee and the staff.

Again, some guidance was developed. Again, that may not be quite so pertinent to a COL where they will probably have it more fully developed. They won't be interested in talking about the major features, they will be coming in with an emergency plan.

And another particular one was essentially, guidance of a probable maximum flood. Again, the staff and the applicant computed these in different ways. What the staff really needed was criteria for whether the applicant's approach was acceptable and how do that review.

High frequency ground motions. Again, that treatment in the seismic hazard is another one. There was some need for some more guidance. One interesting topic came up was, essentially, definitions of extremes of weather. And you know, everybody has been sensitized by the recent hurricane activity. And the question is, what is the reasonable basis over -- or length of time over which to take that data to make sure that you have captured the extremes of weather that you're going to see.

People seem to feel now that there is a fairly long term weather cycle toward this severe storm activity, and we are entering a period of a fairly high intensity, high severity weather cycle for the severe storms, and to make sure that the data that's being used captures that well enough.

Again, I'm not sure exactly how many more early site permits we will be seeing, one for Vogtle, but again, many of these lessons learned should aim considerably in the preparation and processing of the combined license applications as well. That completes my presentation.

DR. WALLIS: The final presentation is my colleague, Thomas Kress. He is going to address the matter of future plant design activity.

DR. KRESS: Thank you, Mr. Chairman. This will be more or less a progress or status report on those activities, as well as on our coordination with the staff on the master integrated schedule.

On the first slide, I have listed the activities we had more -- most activities related to future plant designs. There is no need for me to go over each of these, because my plan is to say a few words about each one of these in the order given, so that each title will come up again.

With respect to the early site permit, you have already heard most of this from my colleague, Dr. Shack, where we have completed three of these and issued a lessons learned report. And our plans are to review the Vogtle application when we get the SER.

And I personally think these have went very well. I thought the applications were generally good, and the staff SERs were well done. So I think it was a good process. All these applications so far have been for sites where there are existing plants. I think it will be interesting if we ever get a greenfield site application. I don't know if we will ever get one, but it should be interesting, because I don't know how you would do an early site permit for one of those, but I think there are some issues.

We have also been heavily involved in the --

COMMISSIONER MERRIFIELD: Before you -- I know you want to move through these. You sort of tantalize that out there, can you just provide a little more on that?

DR. KRESS: Well, most of these sites already have their site characteristics in place, they have their earthquake, they have the things they need to characterize the site. If we have a greenfield site we will have to go back and it will require a lot more, I think, for an early site permit. I think it will almost be a site permit that is just as extensive as ones we get for a new plant. I think a lot more information will be needed. I think you will also need to have your emergency plan already in place. A new generic environmental impact statement. I think there are a lot of things that will be required for a greenfield site that they don't already have in place for the sites that have plants on them. Given that, I doubt if we will ever get a greenfield site.

COMMISSIONER MERRIFIELD: We have got two.

DR. KRESS: Two. Okay. I think those will take a lot more effort to review. That's what I had in mind. We can't just look at differences between the previous site permits and the new one. I think they will take a lot more effort. That's all I had in mind.

COMMISSIONER MERRIFIELD: Just to clarify, on the current list that we have, there is one site in which an entity is desired to seek an ESP at a greenfield site, that would be Amarillo Power. They have not identified what the site is, but under the current plan they would seek an ESP and then go for the COL in the case of the –

(Inaudible)

CHAIRMAN KLEIN: It should be same requirements. Just that the other sites already have a lot of data.

DR. KRESS: That was my point, yes. It will take a lot of review by the staff. The licensee and the staff will have to review it a lot more. It will take a lot more effort. Anyway, that was my main point.

As Dr. Wallis said, we consider our reviews of the design certification as being the area where we have the most added value. So we spent a lot of time on those. And most of our effort has been in that area. We are currently involved in the ESPWR design certifications. We have reviewed the applications of their major computer code TRACG to analyze ESPWR stability. That is a new application for that code. So it the took some review.

What they wish do is predict the ranges of flow at which they are vulnerable to these stabilities, and also predict the frequencies and aptitudes of these with that code. And so it took quite a bit of review on our part.

We did recommend in our letter that this was a good use for the code, and it is applicable for that. We agreed with the staff on that. The staff came to that same conclusion. And there are some restrictions on that conclusion. It is only for normal operations, anticipated operational occurrences and the low power phase of reactor start up. If there are other applications for that, we need to review those further.

We have also agreed with the staff to approve the same code for analyzing LOCA scenarios. And we were involved in reviewing the draft SER for the preapplication. With that review, we basically sent them a letter on -- I think it was 2004. What we did was telegraph -- if I could use a sports term -- telegraphed what we think we were going to be interested in reviewing when the staff comes to us for the full use of TRACG for design certification. There were at least nine of these items. These are what we want you to come prepared to defend when you talk to us.

That should make our reviews a little more effective or at least sufficient. We plan on reviewing the ESBWR PRA, that will be a significant effort. We have plans for a subcommittee early in December and follow that up with full committee when it is needed. And we will review the SER, of course, when we get it. It is expected in 2007.

As requested by the memo from Chairman Diaz, we have been coordinating with the staff on the Master Integrated Schedule. I think that's the direction you folks gave the staff to develop such

a schedule is a very good idea. It looks like a full schedule, very detailed. And we think it will be very useful in making sure the reviews, and our part of review is both efficient and effective.

So far, we provided our planning assumptions to them on this. What I mean by planning assumption is the number, types, date and extent of the meetings we expect to have with respect to all of these, early site permits, the design certifications, and the COL applications. And we met with staff on these assumptions we provided and reconciled how they differ from what the staff is expecting. And that is how we have been coordinating it. So far, we have only had one of those such meetings. We will continue that, of course, because both the schedule and the plan are considered to be a living documents. As things go along and they have to modify it, we may have to modify our schedules. So we will continue that coordination.

We do, as you know, expect a lot of COL applications. We have yet to see one of these, but given the projected number, we have developed what we call our own design centered approach to our reviews. What we mean by that is for each design type, an ABWR or whatever, EPR, we have developed a subcommittee and a specific chairman of the subcommittee.

That subcommittee and that chair will follow all the way through the design certification, the reference COL and the subsequent COL. And for that design -- for which COLs are going to use that design. That will make a continuity to the reviews and we will have at least five or six subcommittees doing this.

When we do our reviews, we intend, for example, on the COLs, we will do most of the COL review at the reference level. And then when we come the actual subsequent COL, we will focus on either action items and on any plant or site specific differences from the reference COL.

And as the Chairman said, we expect a fairly heavy workload with the guidance being developed for new reactor licenses. We have already received the COL application guidance. That's an imposing document, about that thick.

It looks like a good document. We have yet to review it. What we have done is assign separate chapters to individual members on the committee to review. And we have a meeting coming up, I think it's in October -- no, the first subcommittee is planned for November the 30th.

We also already made some progress on reviewing the Reg Guide and Standard Review

Plan revisions, and that does not look like it is going to be as difficult as we first thought, because we have been able to distinguish which ones we think need our reviews.

Finally, we did have our review of the proposed revisions to Part 52. Our letter on this was in May of 2006. On second reading of our letter, I thought it had a bit of a negative tone to it, and I regret that, because I really think we were almost in substantial, if not full agreement with the staff recommendation, and I don't think the letter actually got that perspective across.

These are the items that were our recommendations in the letter. They are almost self-explanatory. If you have any questions about those, I will be happy to answer those when we get to the question and answer session. So with that, I will save us three minutes.

CHAIRMAN KLEIN: Well, thank you for those presentations. As you might expect, being the regulatory agency that we are, we have procedures for which the Commissioners ask questions, and so we will start with Commissioner Jaczko.

COMMISSIONER JACZKO: Thank you, Mr. Chairman. I wanted to start by going back, I think, to the sump discussion. It seems that there are a variety of issues to resolve and work through. And one of the areas I'm interested in, if you have any thoughts on how other countries have dealt with some of these issues, in particular, with the downstream effects. If you're aware of any work that's gone on in France or other places to address that particular aspect.

DR. WALLIS: We did see a Japanese test of rod bundle and the debris capture at the bottom of that. I think that's all I remember from that. Generally, they are doing what we are doing, they are increasing the size of screens and so on.

COMMISSIONER JACZKO: So it has not really been done much?

DR. WALLIS: The downstream effects are still a fairly open area.

COMMISSIONER JACZKO: One other area on that. We had, I think, one licensee -- I think it was Calvert Cliffs, that was interested in using active strainers. They have since abandoned that effort. I think there were some challenges with that. Did you all look at active strainers versus passive strainers?

DR. WALLIS: We saw the correspondence. What we understand is that active strainers are wonderful for reducing the head loss. I mean, they scrape off the material that is blocking the

strainer and they open it up again. But every time you open it up again, more stuff gets through. So they are wonderful for the head loss problem. They are not so good for the downstream effects problem.

I think that's why the enthusiasm for them has been somewhat diminished. They solve one problem, but they make the other one worse.

COMMISSIONER JACZKO: As I think I said, it seems like downstream effects is still an area of some interest. You indicated, I think, in the presentation that industry is doing a lot of research or doing research in this area and the staff needs to continue to do research.

Is downstream effects one area where you would suggest the staff continue to do research?

DR. WALLIS: Well, we wrote a letter and we drew attention to the fact that this was not something that was going to happen. We didn't see much activity. Since then there has been this response. We have not seen a resolution of the issues.

COMMISSIONER JACZKO: You think this is an area where the staff may not have enough information to accurately assess what we are seeing –

DR. WALLIS: That may well be a true statement, yes.

COMMISSIONER JACZKO: -- from the industry.

Turning to another issue. I think, as I indicated, the sump, I think, is an important one, and I think by in large I agree with, I think, where the Committee has come out with, that we need to move forward and try and tackle one aspect of the problem, if we need to adapt and modify later, then we will have to do that as we get new information.

Another area that I wanted to talk a little bit about, we have potentially some time next year we may be looking at a Browns Ferry restart, and I was wondering what your plans are right now for the committee be involved in the restart?

DR. WALLIS: May I turn to Dr. Bonaca on that one?

COMMISSIONER JACZKO: Sure.

DR. BONACA: Yes, we, as you know, Unit 1 was planning to have a 20 percent uprate and we were planning to review the 20 percent uprate. Now, it's not clear how the plans have been

changed, but there is some change there. It seems as if it will go for a 5 percent power uprate at restart.

And a decision we preliminarily made was that we would not review a 5 percent power uprate if, in fact, it is a 5 percent power uprate, but we don't know exactly what it will be right now. If it is, in fact, a 20 percent power uprate, allowing them to escalate to 5 percent, but essentially, providing all the analysis at 20 percent power, then we will be compelled to review that now, I mean, as part of the five percent power uprate.

So we are waiting to hear from the staff what the submittal says and what the request is from TVA, and then we will make a decision on that. Because again, we do not review a five percent power uprate. It is within really within stretch capability of a plant, and also they have had Unit 2 and 3 operating at five percent power uprate for a number of years, so there is no need. But the question is, will then the follow-up SER for a 20 percent contained that is different from the five percent? And the sense I have -- we have at this stage is it may not be very different, in fact. All the analysis will be done at 20 percent.

COMMISSIONER JACZKO: Do you currently then have the opportunity to schedule to do the review at the five percent level if it is?

DR. BONACA: Well, yes, we are scheduled to do that if we need to. Again, it depends on what the analysis are. If it is 20 percent, we have to look at that. The only issue is the timing for that. We heard from the staff that they would not have an SER until the end of November, actually, and we need to have a minimum time for reviewing this material and then conducting at least a subcommittee meeting before we get to the final meeting of the ACRS review. And between that and December 6, which is the date that we meet, there is not much time, if any. So we are waiting to have feedback from the staff.

COMMISSIONER JACZKO: Well, I think it is certainly an important thing. I think we need to make sure that we get you the right information. I wanted to turn a little bit to the issue on the research program and the review that you have done. One of the areas that does concern me a little bit, I think we are seeing it, it has come up as an issue in the high burnup fuel credit area, there seems to me, that there is -- to some extent, there is a lack of research capability in this country that we may

need to work more frequently now with international partners to do some of this research because to some extent the capability does not exist here. That seemed to be an area where we were waiting or trying to work very closely or work through our foreign counterparts to get some data to allow the staff to do some improved analysis on the high burnup fuel credit.

I'm wondering maybe if you could just comment in general on your thoughts on where we are with the domestic research capability, in particular, if we move into an area of new licensing, do you see a need for an increase in our capabilities to really be able to answer a lot of the questions that are going to be important? Any of you who would like to respond to that.

DR. BONACA: Essentially a lot of work has been done with the French to tap the research regarding the criteria to be used for evaluation of radioactive transients in particular. And there, I think, there is sufficient information developed already to modify the regulation. So progress has been made. I made a comment before, just what the report says, which is we are somewhat not pleased with the pace, which this important product, which are very effective, actually, are being implemented in the regulations. So some changes could occur already there.

Specifically, I believe, like (inaudible) accident for PWR, the criteria still on the record, on the book are totally inconsistent with the experimentation data that we have seen, and also with the expected response from analytical tools that are more advanced where you have better use of Doppler feedback and things of that nature.

So I think there, there is already progress done. And if the vendors -- or utilities then intend to go beyond the 62 (inaudible) then, certainly, they would need to have some experimental basis for justifying that. Now, I cannot really comment on the viability of U.S. facilities right now. I don't know if my colleagues have any --

DR. KRESS: If I may comment on that, the French also, one of the effects of high burnup is it -- it has an influence on the fission product release and source term. That data we are getting from the French and it is very useful. And what we need to do is improve our fission product release bottles in MELCOR and incorporate that information in them.

When you do a fission product release test, all you need is access to the high burnup fuel. You can do it outside the reactor. You don't need a reactor to produce that. So we're alright if

we want do some of those kind of tests. I don't think we have the research reactor capability in this country to do any reactivity insertions or to produce long term effects of the high burn up.

COMMISSIONER JACZKO: Any other comments? Thank you.

CHAIRMAN KLEIN: Following along the R and D line, have you provided a list of subjects that you believe would be important for R and D that we are not doing at the NRC?

DR. BONACA: The report sketches out some similar area. We have made some observations in the report and we communicate with the NRC on different presentation of materials. I think the general point is more that there is a need for involvement on the part of Research personnel in the state-of-the-art activities of the general community out there, participation to really bring that kind of insight and experience within the Research group.

But again, in part, the observation has been made because of the resent experience with the -- so many people in Research being moved to security and safeguard things. So therefore, less participation in those areas. But some observation we made in the Research Report, for example, have to do, you know, in the area of PRA, we have an understanding of minor decision diagrams, for example, being developed and used in the community now, and maybe you want to expand on that, George, that are an improved way of dealing with fault tree resolution, and they are not being used within the RES right now.

DR. APOSTOLAKIS: This is a new method that has been in development in Europe for quite some time now. The issue here is really convincing the staff and the industry that the benefits from switching to this new method of evaluating larger diagrams outweigh the expense, because let's not forget that the SPAR models that we are using in the significant determination process all are based on the additional Sapphire Code. So it would be a major effort to switch to this new approach. And the benefits, frankly, are not obvious. But this is one area. Other countries, perhaps, are ahead of us.

Another area, if I may, where we keep coming back to, is the area of human reliability analysis. And we are having a meeting with the staff in November. There, it's not so much that we are not doing much. Right now, this agency has three different models that are based on different assumptions to make human reliability analysis in different areas. And what's worse is that the industry

has a fourth model. And there does not seem to be any effort to try to coordinate all this, and first of all, the agency could have one model, and perhaps, try to collaborate with EPRI and come up with some consensus model.

Now, is that something that is of pure research interest, no, I don't think so, because in power uprates, usually what turns out to be important is that the time of available to the operators to act is shorted a little bit.

Now, if it's shortened from 43 minutes to 40, I really don't have a problem. But, in some cases, it was a significant percentage of reduction from 8 minutes to six or five. And what I have seen, at least, and my colleagues have seen, is that we get a number for the delta CTF, the change in the CTF, which is something like 10 to the minus 3 and so on, and that number is based on a model, which is widely used by the industry, but has never been reviewed by the staff. We have not seen it, but I have seen it in different capacity, and I was very impressed by it.

So, we have a situation there where maybe we can try to coordinate our efforts a little bitter and come up with my view of one model for the agency, but then, really reach out and see whether we can work with EPRI as we have done very successfully in the fire area to develop a common model that everybody will be using, everybody will have approved and so on. So this is another area where we need to do something about. And as I say, we are meeting with the staff in the November meeting to discuss these issues and maybe we will write a letter.

DR. BONACA: The other portion of the observation in the report, which I briefly discussed with Dana Powers who assembled the report, really is more to do with these issues of advanced technologies being developed by an engineering science outside the NRC to bring about virtual facility -- support virtual facility inspections, and essentially, using aggressive computerized systems. And you know, we're not seeing this happening within the Research organization here, because our resources may not be dedicated to that. And so opportunities for improvements in those general areas.

CHAIRMAN KLEIN: I just have another quick question, shifting gears, on the lessons learned on the ESPs. How about lessons implemented? You know, we tend to learn lessons, but do we implement them? Have you looked at that?

DR. SHACK: No, we haven't. The guidance is being developed. As I mentioned, much of the guidance there was a need for, it was developed, it was developed on the fly. So it was not available for the early ones. You know, it's now, I think, available, perhaps, for the future ones. There is still some of it that probably does need to be developed. The preparation of these applications is such a lengthy process, I'm not sure just where their status was.

I have found that most applicants, tend to come to every one of these reviews. They are learning on the fly before the guidance is formalized. So you know, I'm sure they have made some attempt to address this. Again, it would be better to have it fully developed, but, no, I, at least, don't know the current state of the available guidance.

CHAIRMAN KLEIN: I think that would be helpful if you would just take a look at that. Because we tend to often times -- we learn lessons over and over, but we don't necessarily implement them. And I think sometimes we focus on the incorrect issue and implementation is very important on lessons learned.

DR. SHACK: I believe the staff is, for example, working on proposed changes to the rule to incorporate Appendix B requirements, for example, which would be one of the lessons learned.

CHAIRMAN KLEIN: Thanks. Commissioner McGaffigan.

[Commissioner McGaffigan's microphone was not working properly]

COMMISSIONER McGAFFIGAN: Mr. Chairman, I'm going to start with making a comment. I know people would like to see some of the results of research get into our rules more rapidly, but we have a huge rulemaking agenda and we have two offices, (inaudible) the office that has the materials program, and the Office of NRR that have a lot of rulemaking resources (inaudible). And probably (inaudible) but that is -- that's why that is happening, I think.

One point you made, I think Mr. Wallis, you have been involved in security activities and you are not going into them today, Mr. Bonaca was chair of this committee. He pointed out correctly at the time (inaudible) we now have extensive damage mitigation guides being developed as a result of the B.5.b effort. I hope at some point you guys will take a hard look at the extensive damage mitigation guides and hopefully they are (inaudible).

[New microphone]

And Part 52, Dr. Kress apologized for the -- okay. I will sort of look this way and talk that way.

Dr. Kress, you apologized for the tone of your letter back in May, I guess it was, on Part 52. I, for one, appreciate the support for a living PRA. Since it was not in the rule, you were differing from the staff, you were also differing from the staff in some of those other high points that you made mention in the letter. I have not looked at the Part 52 that's been tossed on the web page as the staff's proposed final rule.

I sure hope there is a living PRA requirement in there, but I'm a doubting Thomas until I see it.

The digital I&C issue, you might -- there's going be a question here. The staff seems to want some sort of a back up to the digital I&C. The Fins required an analogue back up to the digital I&C. The staff seems to be worried about things like electromagnetic pulses, which can't be generated by things other than nuclear weapons.

And so tell me, whichever one of you is the expert -- looks like Dr. Apostolakis is moving to the mic -- what is reasonable in the way of a back up -- what is reasonable in the way of a back up to digital I&C? Are you guys struggling with it? The staff had a meeting yesterday with industry, I don't have the result, but are you guys struggling with what is a reasonable back up to require? You have not thought about it yet.

DR. APOSTOLAKIS: The issue has not come up before the committee.

COMMISSIONER McGAFFIGAN: Well, I will tell you on Tuesday of this week, the industry was telling us that they are going to be ordering simulators in the spring of 2009 and they sure would like to have some guidance on digital I&C's sooner rather than later, and we are going to have a meeting on that next month. So I hope you guys -- it's on your list. But please pay attention and get the staff to brief you sooner rather than later.

DR. KRESS: May I?

COMMISSIONER McGAFFIGAN: Sure.

DR. KRESS: One of the advantages of being the senior member on this committee, I remember a lot. This did come up back during the days when we had Paul Sheuman, Hal Lewis,

Ernest Wilkins and people like that on the committee. And that -- we wrote some letters back then. This would be in the early 90's.

And the committee at that time was seen -- I think I remember this correctly -- they thought it would be ridiculous to have an analogue back up to the digital system. What you ought to do is fix the digital system so that they are not as vulnerable.

COMMISSIONER McGAFFIGAN: As I understand it, pardoning digital systems, you know, totally.

DR. KRESS: They may not have been -- the committee may not have been aware of that at the time.

COMMISSIONER McGAFFIGAN: In any case, the staff is struggling with what -- as I understand it, having talked to a couple of senior staff -- what this back up is. And they claim it's not the finished back up, but it's also not nonexistent. And I understand sort of their concern, you know. And one industry guy said to me, he would not mind having some sort of analogue scram device in the control room in case everything else goes hay wire or back in the control panels elsewhere in the plant or whatever.

But people have to think that through and they are begging us for guidance. You know, whatever we end up with, as long as it is reasonable, I suspect the industry will happily do it. But we need to figure out what that is.

Were you guys involved in the hot short generic letter at all? Did you guys take a peak at that particular?

DR. APOSTOLAKIS: Yes.

COMMISSIONER McGAFFIGAN: And you supported doing something that cost $200 -- $500 million; that has $18 to $19 million worth of benefits -- or $18 to $36 million worth of benefits; that was position of the ACRS.

DR. APOSTOLAKIS: The recommendation is two lines.

COMMISSIONER McGAFFIGAN: What did you say?

DR. APOSTOLAKIS: The generic letter should be issued after the scope of requested information is clarified and the submittal dates are made more realistic.

COMMISSIONER McGAFFIGAN: Okay. Well, it is probably not your job to question backfit and to question cost benefit, but I have done that. That's not a particularly helpful letter for me.

Well, CRGR -- I think trying to help the staff figure out how to square the impossible in that particular case. Apparently, it's allowed under the Backfit Rule if the staff has 14 or 2 different perspectives on an issue, documented in various and sundry ways, they can choose one and say that is our internal position motion and always was our position, but I did not think that was allowed, but apparently CRGR does.

The last comment -- I'm taking about the same amount of extra time as others -- the technology neutral framework.

Mr. Bonaca, you said, you thought it was worthwhile to continue to work on it. You probably have seen my vote; I called it the triple hyphenated grand unified theory. If you're -- that's for the physicist in the audience, which we have -- wouldn't it be better for us to figure out what we need to do for gas cooled reactors and for liquid metal cooled reactors. Figure out what the design criteria are, figure out what the design based actions are, get a framework in place, at the same level of detail we have for light-water reactors.

If we don't do that -- if you guys keep up here in the clouds, worrying about phrases and you never get to developing guidance, DOE is never going to have very good guidance for high temperature reactor or for a burner reactor. They are just not going to have it. They are going to come in to us and we are going to have nothing. We are going to have a bunch of highfalutin phrases.

DR. WALLIS: You want something useful, I think we firmly believe that there are principles of regulation that apply to any reactor and they ought to be properly articulated, and there ought to be a way to translate them into action. I don't think we're in the clouds. I think we may have the same criticism of some of the things we have heard.

Several of us think that there is a real opportunity to have a framework which applies to anything and you can then appeal to it no matter what comes up in the future. This will be a big step forward for future regulation, and I don't think it is up in the clouds if it is done properly.

COMMISSIONER McGAFFIGAN: I was once a theoretical particle physicist --

Commissioner Jaczko was more recently one -- I never could get into strength theory and all that stuff, because I sort of like to have things that worked, you know model that sort of worked. And then work on another thing model that sort of worked and built from that, rather than work on theories that, you know -- unless NASA gets a factor of ten to the 50th increase in its budget will never be tested in any accelerator, which they could not build anyways, whatever.

But the technology neutral frame work, the documents as I have seen them so far look a lot more like string theory than they do like anything that's practical.

CHAIRMAN KLEIN: The advantages, Commissioner McGaffigan is that you're an applied physicist as opposed to a theoretical physicist.

COMMISSIONER McGAFFIGAN: I was a theorist supposedly.

CHAIRMAN KLEIN: Commissioner Merrifield.

COMMISSIONER MERRIFIELD: We don't hold that against you.

Well, I frequently come after come Commissioner McGaffigan, and it is a good thing, because he raises lots of issues that triggers some thing. Sometimes I disagree with him, here I'm probably going to agree with him a lot more than otherwise. I will go somewhat backwards. I think Commissioner McGaffigan makes a valid point about a technology neutral framework.

I'm a lawyer, and I also like to think of myself as a common sense Yankee. And I worry about costs and I worry about benefits, and I worry about utility and efficiency and those kind of things. And if I am someone that wants to come in with a gas cooler reactor, and that's the most likely thing we're going to get after a light-water reactor; I would like to know what the guidelines are going to be for me to deal with that.

And so in a time when we have all these other things that we are dealing with, to spin around and spend a lot of time trying to get a technology neutral frame work, if it's at that theoretical level that Commissioner McGaffigan has spoken about, I really have got to question that approach. But that’s an editorial comment.

On digital I&C, clearly, we received from our commentators on Monday, the need for making a resolution on that. I don't know where the staff currently is. My guess is like a lot of other things, there may be different opinions within the staff and we don't necessarily have the full opinion

of our senior management yet as to what their view is, ultimately, that is the recommendation the Commission will receive.

It does seem obvious to me while digital I&C is a bit newer for this industry, you know, there are a lot of airplanes flying in the clouds right now that use digital instrumentation and control and do it in full protection of public health and safety, and many other industries, including folks in the oil and gas industry. Mr. Chairman, you're from Texas, that is a pretty vital one down there, us digital I&C and have for many, many years. I do want to make sure that if we're going to do things that it borrows from those technologies and does so in a way that meets or our effectiveness, timeliness and other strategic goals.

In terms of some of the comments, going back to Tom Kress, just for the sake of clarification, I appreciate the comment about the difficulties associated with EPS. We have a greenfield ESP, it is something new for us, is, obviously, going to require some review. The form of the application that would come in, and the expectation that we should have is the same, whether it's a new site or a site which we currently have a reactor.

I would certainly want our staff to take away the message here from us we would expect the same type of timeliness, efficiency and effectiveness for those applications as we would for someone with a site where you have a currently existing reactor. True, you don't have the same breadth of history, because you have not been operating a reactor at the site for 20 years, but nonetheless, the standards used for evaluating seismicity, weather impacts, meteorological impacts, and things of that nature is not any different. And so we need to make sure we apply the right criteria in there.

And I would not want your comments -- and I don't think this is what you intended -- I wouldn't want your comments to unnecessarily discourage a licensee or a potential licensee from bringing in a greenfield site, because under our rules and regulations, that is perfectly valid.

DR. KRESS: Thank you for that clarification, that's exactly what I had in mind.

COMMISSIONER MERRIFIELD: I always love it when I am on the mark with ACRS.

The final one on your slide, slide 43, was a recommendation relative to revisions to Part 52. And the bullet was operation of the five percent power even with deficiencies and emergency

preparedness. I think I know what that means. I'm reflecting on Shorea in which a previous Commission granted a low power license, allowed that reactor to get up and operating, and needlessly, complicated the decommissioning and costs of that decommissioning for a reactor that ultimately never operated at full power. Was that part of your discussions when you talked about that recommendation or not?

DR. KRESS: In a sense, when we looked at deficiencies, we didn't think that would exist major deficiencies, not considering the Shorea problem a major deficiency in an emergency plan. If there was something like that, we think the site would not even be allowed for an early site permit in the first place. So these deficiencies we are talking about are not huge. And this was a -- what I think would be a risk informed decision.

If you are putting one of these new design plants on an existing site, the additional risks that one poses at that site is going to be almost a tiny increment over what is already there. And we didn't think that additional risks, especially at a 5 percent power level, should stop the testing at that level and the pre-operation at that level, as long as the deficiencies were not huge in nature. That was the context.

COMMISSIONER MERRIFIELD: I appreciate that clarification. Again, in the absence of that clarification --

DR. KRESS: We certainly would not have that bullet for Shorea.

COMMISSIONER MERRIFIELD: The final one, and this is more of a comment. I have been in the Commission now for three days shy of eight years. I appreciate the review that was conducted on the research program. It was one that I have long been a proponent for ACRS to look at our research issues and have been a real champion, I think, of you doing that.

I'm reminded, however, back when I came on board with the Commission in '98, our budget for Research was about $40 million, down from its historic high of $240 million. Today, if my figures are correct, it's about $65 million for fiscal year 2007. So we have made an increase in the amount of money we are putting -- as a general amount to research.

The debate about the amount that we spend on anticipatory research versus the amount that we spend on user need research, or whatever term of the day we are using in that regard is --

seems to me to be somewhat the same today that we had eight years ago.

I know that with an organization such as ACRS, with such a rich sprinkling of individuals both from universities and other research institutions, obviously, it is your eye to keep a ball on that matter, but it is a struggle that we have had for many years and one that is not new in the discussions we have had in front of this Commission. Thank you, Mr. Chairman.

CHAIRMAN KLEIN: Mr. Jaczko.

COMMISSIONER JACZKO: I just have a quick follow up question to Dr. Apostolakis. I guess I couldn't let this one go. You did say at one point we had three different models for human reliability and one industry model. I guess the question I would certainly ask is, do those models ever agree?

DR. APOSTOLAKIS: Well, that's, in fact, one of the problems, nobody has bothered to compare.

COMMISSIONER JACZKO: We have never used any of the models in a comparable situations?

DR. APOSTOLAKIS: No. At least, I think they are aware of the existence of the other models, but, no, the assumptions are certainly different.

COMMISSIONER JACZKO: Thank you.

DR. APOSTOLAKIS: Especially, the model SPAR H, which is used for regulatory applications. It seems to me it should be scrutinized and made consistent with the other models, because that's where we did interact.

COMMISSIONER JACZKO: Thanks.

CHAIRMAN KLEIN: On the R&D budget that Commissioner Merrifield indicated, I also have a concern about our lack of an R&D budget. Obviously, the constraints that the NRC is placed under for 90 percent cost recovery tends to force us to look at an R & D program directly applicable to the licensing activities. I believe the agency would be better served to license from a strength position so that our R and D would be more long-term looking, rather than a short term focus. And I think we would benefit as an agency from having the R and D budget taken off the 90 percent recovery mode. I assume that that would be a position supported by ACRS?

DR. WALLIS: We don't usually get into budgetary matters, Mr. Chairman. I can tell you what think when I meet with you privately. We don't usually take an ACRS position on budgetary matters.

CHAIRMAN KLEIN: On another issue that was raised earlier was our IT capabilities that you indicated on the ESP. I think you have probably seen some of my concerns on IT, the first document I received from the NRC.

DR. SHACK: We all used Adams.

CHAIRMAN KLEIN: I could not open it. So we hope that we can move forward on our IT capabilities and move forward.

COMMISSIONER MERRIFIELD: Mr. Chairman, I got to -- we have had a lot of challenges. I got to give our staff some credit. ADAMS is a whole lot better than it was. It has demonstratively improved as a product for this agency. So I mean, it was a real struggle, and it is going to be web-based, and it is not perfect; but you know, it was a risk of us trying to be cutting edge in terms of putting all of our documents out in a format that was available to the public.

So you know, there are problems, and I would certainly agree that there are improvements we can make in our IT technology, but I do think our staff in that particular case has been making some real efforts to try to improve it.

CHAIRMAN KLEIN: We just have opportunities for improvement.

COMMISSIONER MERRIFIELD: Yes.

DR. KRESS: With your indulgence, may I make a comment on the technology neutral framework. I can't resist leaving without saying something. That's my purview in the committee.

What the committee, I believe, feels is needed in the way of technology neutral framework is a systematic way to define design basis accidents for the different things, so that you end up having a deterministic system of regulation pretty much like we have now, but with design specific, design basis accidents. And we didn't really see that they were working in a systematic way to define those. And if you do that, you need to define figures of merit for these things, and they are going to be different.

You need actually to have a way to check to see if you really end up with -- when you do

the design basis accidents and using the margins and the conservatism, you need a way to check to see if you rendered the plant at an acceptable level of risk. So you need to combine both the risk concepts, and you may need a PRA for these things in this whole process, and that may need be an integral iterative thing.

So I think working on a technology neutral framework in that context, you can do pretty much what I think you were asking for --

COMMISSIONER McGAFFIGAN: I agree, but I think you would be best off developing that for a high temperature reactor, developing that for a liquid metal cooled burner reactor. And then, saying, okay, we thought we had these general principles, now we really do have them, my God. You know, if you start with these general principles you end up with these design criteria, and you end up with these follow on guides and everything hangs together.

At the moment we are working on highfalutin criteria. And I don't think -- you know somebody is going to be working, because DOE is going to be paying to us to work on high temperature reactors and one of these days if GNEP is real, we will have to be worrying about burner reactors. But at the moment, we don't have clear thoughts as to what we would do with design basis accidents for those technologies, I don't think. From what you can derive the general principles that apply to light-water reactors, gas reactors and metal reactors.

DR. WALLIS: May I suggest something. Before we knew about the Second Law of Thermal Dynamics, people might have said it was a highfalutin criteria, but as soon as we found out how to use it, it, became extraordinarily valuable.

COMMISSIONER McGAFFIGAN: Okay. Well, it's a question of whether we are dealing with the Second Law of Thermal Dynamics or string theory, but let's just pass on.

I do want to associate myself with Commissioner Jaczko and Dr. Apostolakis. We do have to on these human reliability models get something that's saying and works across the board. There is tremendous uncertainty in them, and I am sure they all have tremendous uncertainties. I don't know which numbers to use, but people should, at least, understand the model and understand the uncertainties in the model and not have four different ones if we can avoid it.

And then with regard to research, I have been here like Commissioner Merrifield, a long

time. I think if you make compelling cases for longer term research, the Commission will listen. But I think people might have to make -- and we might even do it within the current fee structure. It would be, obviously, easier if we can get the research off the fee base or most of it.

And I would support that. But often times it is not compelling. That does not mean it has to be near term, but, by God, this is an important area, and we should be investing in it, and we should be doing something about it, and I don't see compelling justification coming forth from the staff. Just help them justify it better and I suspect they will get a better reception on the Commission even if it is longer term and not connected directly to a near term regulatory requirement.

COMMISSIONER MERRIFIELD: Can I make a comment on that? I completely agree.

One of the issues that we grapple with is, in the past, it is always based on some percentage. We ought to reserve "X" percentage when we deal with anticipatory research. That does not carry very well when you have got to explain -- when we have to go up to Capitol Hill and explain to members of Congress what we need this for. Why did you pick out that number? Well, it seems like a good number. I mean, that really does not do it.

If there are areas where we can identify we ought to be doing anticipatory research in such a way as we can defend it, I agree with Ed. I think that is something that the Commission should certainly consider.

DR. WALLIS: Can I add something on the sump matter, since it is priority matter for the Commission. I think we may have reached the point where the ACRS has fulfilled its role. We have given advice, we keep giving sometimes the same kind of advice. Now, the staff knows what do. Industry knows what do, and they are going forward. It may well be that we done our bit on the sump matter. We have contributed, we have added value, I hope, and it may well be that from now on it is a matter for staff and industry to work out.

COMMISSIONER MERRIFIELD: I was going to say -- Okay.

Well, just following up on that one comment -- and I appreciate your saying you think we're done. Going back to your bullets on page 20 on that issue, the first bullet says, ACRS questions how the NRC will determine the adequacy of plant specific solutions. In your statement you said,

obviously, we need to continue existing research.

Do you have specific recommendations to the staff about how we are doing to determine the adequacy of specific solutions or does this remain more --

DR. WALLIS: I think -- well, the usual answer we get from them is we have to wait until we see what the solutions are. We don't have a template or some sort of a checklist or something, because we don't really know what the solutions are going to be or what the rational behind them is going to be. So it is the staff's position and I think we supported this until they see what industry submits, they don't really know how they are going to evaluate them.

They have a plan to -- I think it is by now, it is eight pilots they are going to evaluate, and there will be different features of all of those pilots.

COMMISSIONER MERRIFIELD: That is a fair answer. The problem is looking at it from my side of the table, it sounds as if we are asking people to bring us rocks. And when we finally get the rock we want, we will be satisfied.

DR. WALLIS: I think it is a technical solution, it is a technical design, which usually is a little more complicated than a rock, it usually has to meet some criteria, and the criteria are very clear in the ACRS rules. So I think it is going to be -- it should be straight forward as long as the engineering is done right.

COMMISSIONER MERRIFIELD: Thank you Mr. Chairman.

CHAIRMAN KLEIN: Commissioner Jaczko.

COMMISSIONER JACZKO: I don't have any more questions.

CHAIRMAN KLEIN: Thank you for your comments. I think we're moving into a different era than probably ACRS has had for the last several years, and one of the main reasons, as I understand the ACRS being formed was to give us advice on operating reactors. And if the number of COLs materialize, it indicates that they might, I think your scheduling challenges will be to address those. And so I think we are all facing a new scheduling dilemma. And so as those come in, I think the way that you allocate your resources and your time will be different than it has been in the past several years. So we appreciate your guidance, and the meeting is adjourned. Thank you.

(Whereupon, the proceedings were adjourned.)