UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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MEETING WITH THE ADVISORY COMMITTEE

ON REACTOR SAFEGUARDS (ACRS)

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ROCKVILLE, MARYLAND

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THURSDAY, DECEMBER 8, 2005

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The Commission met in open session at 1:OO p.m., at the Nuclear Regulatory Commission, One White Flint North, Rockville, Maryland, the Honorable Nils Diaz, Chairman of the Commission, presiding.

COMMISSIONERS PRESENT:

NILS DIAZ	Chairman of the Commission
EDWARD MCGAFFIGAN, JR.	Member of the Commission
JEFFREY S. MERRIFIELD	Member of the Commission
GREGORY B. JACZKO	Member of the Commission
PETER B. LYONS	Member of the Commission

(This transcript was produced from electronic caption media and audio and video media provided by the Nuclear Regulatory Commission.)

STAFF AND PRESENTERS:

GRAHAM B. WALLIS, Chairman

DR. WILLIAM SHACK, Vice-Chairman

DR. DANA POWERS

DR. THOMAS S. KRESS

DR. GEORGE APOSTOLAKIS

DR. RICHARD DENNING

J.S. HYSLOP

P R O C E E D I N G S

COMMISSIONER MC GAFFIGAN: Good afternoon. We are going to get started.

The Chairman regrets he is going to be a little late. He is downtown and I am sure doing important things for the agency. The last time he was late for a meeting, he was working on our budget. I'm not exactly sure what he's working on now, but these are good usage for the Chairman.

Good afternoon, Dr. Wallis, and other members of the Committee. We are meeting this afternoon for a briefing on the status of the committee's activities on several important areas the agency is actively engaged in.

The Commission values the independent views of the ACRS when dealing with complex technical issues. Your role will become increasingly more important as the agency continues to experience an increased workload in the area of new reactor licensing.

In fact, one of the primary reasons the ACRS was formed by the Atomic Energy Act of 1954 was to review and advise the Commission regarding each application for a license for a facility.

The challenge you will have is to balance the breadth of issues you review with the depth that you provide on each issue.

The ACRS has already streamlined its review of license

renewal applications, streamlined the Committee's view of other areas may be appropriate to allow the Committee to focus on the more significant and complex issues that the agency will be facing.

With that, I look forward to your presentation.

Those were remarks that were drafted for the Chairman by his staff. And I think they are good remarks, so I endorse them and read them.

Do any of my colleagues have something they would like to say in the way of an opening statement before we turn it over to Dr. Wallis?

Okay.

DR. WALLIS: Thank you, Commissioner.

We welcome the opportunity to discuss some of our work with you today. Our presentation is organized the same way as the last one that we made to you, in that I will first present an overview and then my colleagues will discuss some of these topics in greater depth.

Would it be your wish that we make our entire presentation before you ask questions?

COMMISSIONER MC GAFFIGAN: That is correct. You will make your entire presentation. Then we will go in an order to be determined in asking questions.

DR. WALLIS: Okay. I will proceed with my overview

then.

On the first slide -- there is a slide show that will appear. At least you have it in front of you. It says that we have written 25 reports since we last met with you. I will mention a few of the topics.

COMMISSIONER MC GAFFIGAN: I will say to my colleagues -- and I will probably be the first to offend -- if somebody wants to ask a clarifying question during the course of the presentation, don't feel shy, at least while I'm chairing.

COMMISSIONER JACZKO: Can I clarify what a clarifying question is?

COMMISSIONER MERRIFIELD: As the individual who invented the use of the clarifying question, the use is supposed to narrow in scope to provide understanding of the materials as presented.

COMMISSIONER MC GAFFIGAN: You have heard his explanation. You can stay as close to it as you dare.

DR. WALLIS: Well, I am anticipating that it won't be necessary, but we will see.

COMMISSIONER MC GAFFIGAN: Your presentation is going to be so clear that it couldn't possibly --

DR. WALLIS: On the first slide of our accomplishments, you will see there is a topic, "Risk-informed alternatives to the single failure criterion." The staff made a presentation to us. They suggested

various alternatives. And we agreed with them that these were interesting, but it was premature to make a choice before stakeholder input had been received.

We have been assessing the quality of selected NRC research projects in response to a request from the division of Research.

COMMISSIONER MC GAFFIGAN: Are you going into that in more depth later? Is that one of the --

DR. WALLIS: No, it is not one of the ones. But you can certainly ask questions about it.

COMMISSIONER MC GAFFIGAN: I will say in passing, speaking as one Commissioner, that I thought that was an excellent report.

DR. WALLIS: Thank you.

We have reviewed the digital instrumentation and control systems research plan. And we thought it was a good plan. And we thought it addressed an important need.

The Revision 4 to Reg Guide 1.82, this concerns the recirculation failures of core cooling following a LOCA. And the reason that we reviewed only addressed the issue of containment over pressure credit for BWRs. And our recommendation was that further work was needed before this revision was issued.

We reviewed the generic letter on grid reliability, and we approved it.

Next slide.

License renewal. We have completed review of five license renewal applications since we last met. Most of them are straightforward.

Browns Ferry, as you know, presents some new issues on which we have made some preliminary comments.

On the next slide, the license renewal process has matured. Its efficiency has been increasing. It may have reached about as efficient as it can get by now. This has been helped a great deal by the staff developing these renewal guidance documents. And we will perform five more of these reviews this year.

We completed our review -- on the next slide -- of the North Anna early site permit, the first of several ESPs.

On the Clinton ESP, there is a new issue which is the performance-based seismic hazard analysis presented by the applicant, which the staff needs to understand and evaluate.

And just -- in this present meeting, we are completing the review of the Grand Gulf application.

You have before you a list of our future activities. Many of these are continuations of past and present activities. I will pick one or

two from each one of the slides and say a few words about them.

On the first -- they are alphabetic, you may have noticed. The first one on the list, advanced reactor designs. We had a meeting with the office directors and with the EDO earlier this year. And the EDO sketched out an anticipated workload for the next few years in which an advanced reactor design review figured very greatly.

So we anticipate, if he is right, we will have to plan a suitable response to this workload coming down the pike in terms of resources, staff, and Committee skills and so on.

COMMISSIONER MC GAFFIGAN: The ESBWR has been accepted by the staff?

DR. WALLIS: It is going to come along fairly soon, right.

On the next slide, I will pick out the issue of PWR sump performance of great current interest. At the moment the staff is in the phase of gathering information. It is performing research and evaluating the licensee's responses to a generic letter.

So we are waiting to hear what they discover and what they conclude from this information gathering. That's the stage that we are at, waiting to hear from the staff.

COMMISSIONER MC GAFFIGAN: Is that even scheduled, your next interaction?

DR. WALLIS: We expect that it will happen, I would think,

within a few months. But I don't think it's immediate. It's not immediate.

COMMISSIONER MC GAFFIGAN: I would hope it would be within few months. February subcommittee?

DR. WALLIS: February or March.

On the next list of activities, I will pick up the safety management. We are following the staff's efforts regarding safety management including safety culture. And we are trying to see how we can best contribute to those efforts.

COMMISSIONER MERRIFIELD: Just by way of clarification. The Commission in its SRM talked about safety culture and asked the staff to consider whether we should think of it in terms of safety management.

But the Commission didn't explicitly state that we were going to use safety management.

DR. WALLIS: There are these two words. They define different things, I think.

COMMISSIONER MERRIFIELD: They do. And internationally, they can have quite different meanings.

DR. WALLIS: Maybe we could help clarify what the meanings are.

COMMISSIONER MERRIFIELD: I would argue there are

probably better uses of your time. My only reason for raising that is I think you need to be -- the Commission hasn't necessarily endorsed that, in other words. We are asking the staff to consider it.

DR. WALLIS: That's fine.

COMMISSIONER MC GAFFIGAN: I will ask a clarifying question in the sense that -- which may be slightly around Commissioner Merrifield's definition.

Advanced reactor designs are down -- but the staff has committed to the industry several very significant activities in which you all might be able to contribute – the Standard Review Plan that they are going to use for COL applications, the content of the COL applications, which is an endorsement of an NEI document.

We have a 73.55 rule making. We have this multinational design approval program. And then we have got the Part 52 stuff that you have already looked at.

There is a lot to say grace over. Is your sole focus at the moment the design certs or is it to help the staff sort through all that stuff and figure out where the priorities are and whether they are on the right course?

DR. WALLIS: I am sure we could help the staff.

COMMISSIONER MC GAFFIGAN: We will get back to that. I will come back to that in my questions.

DR. WALLIS: We will come back to that.

The other topic I would like to pick up on this list of activities is the technology-neutral framework. We spent a lot of time discussing features of this framework for future reactors. In particular, we tried to recast the issues as a more appropriate sequence of questions and answers.

And my colleague, Tom Kress, will have more to say about that later in this meeting.

That concludes what I have to say. The more substantial presentations will follow. The next speaker on the program is my colleague, Dana Powers.

DR. POWERS: I want to talk to you about some of the aspects of modernization of 50.46.

Usually when you talk about 50.46, you think in terms of pipe breaks and thermohydraulics, and I instead want to talk about what is really important, talk about the fuel and the cladding.

As most of you are aware, the existing regulations on the clad are clad specific. They speak exactly in the regulations about the Zircalloy and Zirlo clads.

Almost from the day that was written it became a problem because clads evolve. The alloy used for coating uranium dioxide fuel we now have people moving in especially toward niobium alloys and

zirconium fuel.

And we can be fairly confident that clads will continue to evolve as advanced reactors are brought on line even when they use water technology. Certainly if we move away from water technology, we are going to have very different fuels and very different cladding.

The regulatory objective of 50.46 dealing with the cladding is to assure that you maintain core coolability in the event of an accident. It doesn't do any good to have an emergency core cooling system if you cannot, in fact, cool the core.

There is a logic in the decision that a core is coolable built into the regulation. The logic goes you can maintain coolability if, in fact, you maintain the core geometry. You can maintain the core geometry by keeping the fuel within the clad. You can keep the fuel within the clad if you retain some ductility.

Now, the ductility we are talking about here is not the ductility at temperature. It is the ductility when the core is quenched.

Preserving ductility in the case of the zirconium alloy clads means to limit the amount of hydrogen taken up by the clad during normal operation and the amount of oxygen that the clad takes up during the accident transient.

Zirconium is unusual among metal alloys in that it can absorb both oxygen and hydrogen. And upon cooling those alloy

elements make it brittle.

Well, as you are aware, we have been using fuels to ever higher burnup. Certainly, 20 years ago burnups on the order of 20 gigawatt days per ton were common. Now we are approaching over 50 typically and limit at 60.

And that does have an effect on clad. And the staff has an active research program in looking to see how these high burnup fuels respond under accident conditions.

I think we briefed you before on their work on reactivity insertion accidents. They have also gone on to look at how the high burnup fuels behave during loss-of-coolant accidents.

And what they have found is there is synergisms between hydrogen uptake during operations and the uptake during the transient associated with a large-break LOCA that leads to enhanced embrittlement of the cladding.

They have investigated that, and formulated a new set of embrittlement criteria that could replace those that we now have in the regulations. They are fairly involved criteria, much in parallel with the existing regulations involving testing of the cladding and then under high temperature conditions and then looking at its embrittlement at low temperatures.

The criteria they have developed are fairly clever and well

researched. They do result in having an alloy independent process for assessing cladding, but there's still very much technology specific regulations.

ACRS reviewed this work. Our conclusions are an excellent piece of research, a well-conducted exemplary piece of research in that it involved a substantial coordination between not only NRC researchers, but industry researchers as well.

We agreed that it was very important to update the regulatory requirements. In fact, these particular requirements in 50.46 have needed updating for 20 years.

The regulatory requirement, however, we thought should be to preserve core coolability in design basis accidents. That any technology-specific requirements ought to be relegated to the regulatory guides associated with that technology specific application.

This would have the effect of making this particular aspect to the regulations technology-neutral and still preserve the detailed work that the staff had done in researching this particular high burnup clad behavior.

COMMISSIONER MC GAFFIGAN: I think this is a clarifying question. Is this in – updating regulatory requirements, the 50.46 rule that is currently up for comment, is this in there?

DR. POWERS: No, it is not.

COMMISSIONER MC GAFFIGAN: It's not.

DR. WALLIS: The next speaker is Tom Kress.

DR. KRESS: Thank you. This topic has a couple of issues associated with the new plant licensing, the technology-neutral framework.

We did spend considerable time on these issues, mostly because of the perceived importance of it by the committee, but also because we wanted to be sure to get it right.

I must confess that it turned out to be one of those rare occasions in which we disagreed both with the staff and disagreed among ourselves. We don't often disagree among ourselves.

Nevertheless, I'm personally quite pleased with the content of our letter with a couple of minor exceptions. I think it does have some good messages and good recommendations in it.

The review was limited to just two policy issues at this time. There are a number of policy issues I know you are aware of. We will take on those others later.

This was restricted to two policy issues. They were phrased in SECY-05-0130 by the staff in terms of these two bullets on the slide.

One is: In anticipation that there is a need for enhanced safety for new plants as expressed by the Commission, just what is

meant by enhanced safety, and what level do you cast it at? That was question one.

Question two is, given you can determine what is meant by that and set values on it, how shall you deal with multiple reactors on a site?

Now, the motivation for that part of it, I think, has to do with how you really deal with modular plants. You know, it's pretty clear how you deal with multiple plants.

So, in response to these two questions, the staff made recommendations. Their recommendations on each of the two issues were that the minimum level of safety for enhanced safety would be the plants meet the current QHOs by design. And that with respect to the risk of multiple plants, only new plants put on a site would be required to meet the QHOs.

Now, these are the two items that we completely disagreed with. The reasons are that the ACRS views that there two kinds of safety.

There is safety inherent in the design of the plants. That is one kind. The other kind of safety is what kind of risk is associated with the plant's site given to the public. Those actually are related but they are not the same thing.

And the QHOs that the staff wants to use for the minimum

level safety are site risk parameters. And they involve things like meteorology, population density, population centers, seismic; a number of things like this that relate to how many plants are on the site. What is their power level? What type of reactor is it?

These are things that are really outside and beyond the control of the designer. It's asking too much of a designer to factor those things into his design at the time that he is putting together a reactor concept for certification. This is asking too much.

Since the QHOs are of that nature, we think the staff is inappropriately mixing these two types of safety. They shouldn't be mixed like that.

The ACRS view is that design safety, something that is under the control of the designer, can be specified by core damage frequency and a large relief frequency.

Now, the large relief frequency is not the large early release frequency. It's the total release.

These are things under the control of the designer. And in fact, those are the things he shoots for. And we think if you want an enhanced level of safety, you specify what those values should be.

Plus that's not the whole story. Enhanced safety would involve how you deal with defense-in-depth, allocation among risk sequences, how you deal with the uncertainties.

In my mind, you might also want to deal with design basis accidents. How do you go from these concepts to define certain design bases accidents?

That's the design safety that I talked about.

The other kind, risk of the site, is related to the other two bullets. And when you assess the risks at a site to the public, you should consider all radioactive sources on the site. The number of plants, the power of the spent fuel pools, et cetera. And so you just don't want to make a site risk that says new plants on there, meets the QHOs.

In our view, the QHOs are suitable site risk acceptance parameters, if you want to view them that way. The problem with the QHOs that we now have is that they are individual risks. And that means that you calculate the insult, whatever that might be, but in the denominator you put the population.

We think that's an insufficient description of risk. There are insults that include things like, that we call societal risks, the total number of fatalities, probabilistic fatalities, the total amount of land contaminated. Things like what happened at Chernobyl and so forth.

Those are things that regulations are concerned about. And there are things in our regulations that try to deal with societal risks. Mainly it's the site suitability criteria.

But if you are making a new technology neutral framework, you need to explicitly deal with this someway.

So we suggested that the QHOs need to be supplemented by societal risk criteria.

With respect to how you deal with -- you know, if you use CDF and LERF as your design safety parameters for enhanced safety, the question arose as to how do you apply those to modular plants. This was an area where the Committee was of two minds.

The first mind thought that modular designs should be viewed as a package. You specify at the design certification stage how many modulars you are going to have. And that total number of modules then has to meet the specified values for CDF and LERF.

That means each module would have one over n, where n is the number of modules of each of these.

The other view, the more rationalist view, is that each module can -- you probably know where I stand -- that each module is basically relatively independent of the other modules.

There are some interconnections. But as a reactor and a coolant system, and an ECCS and a shutdown system and a long-term cooling system, they're basically independent of each other. As such, each module should be treated as an individual reactor.

Therefore, you apply the CDF and the LERF to each

module. And you don't want to hamper it with trying to figure out how many you are going to have ahead of time.

And as a final added benefit, the ACRS threw in a couple of items. We recognize that using CDF and LERF has heavily -- and requires good PRAs. And that the fact that we have good PRAs for current plants is largely the result of the operating experience and long-term use with them.

So there may be a problem with PRAs for new plants. We have to focus on that. They have to have the right scope. We Need to develop failure rates of new components and have to -- the basic message was that you have to deal with the uncertainties and you have to retain some concept of defense-in-depth.

We don't have a good definition of what that means, defense-in-depth.

And we threw in at least a hint of what might be a good societal risk meaning. It was just a hint.

COMMISSIONER MERRIFIELD: Commissioner McGaffigan, I think virtually every Commissioner at one point or another has weighed in with the notion that we support a process in our agency where differing views are accepted and welcomed.

And I think as it was pointed out today, we don't see this that often from ACRS. There is typically a degree of unanimity among

their proposals. Some of the sausage-making that gets to unanimity, we don't necessarily get to see or are a part of, but it does happen.

We do have, in this case, an exception to that. I would made a note, when Dr. Kress was talking about the ACRS being of two minds --

DR. KRESS: I probably should have said of about eight minds.

COMMISSIONER MERRIFIELD: But there were differing views.

Frankly intuitively, I guess perhaps not rationally in your terms, but intuitively to me the notion that you would consider a six-pack, eight-pack, twelve-pack of pebble bed reactors to me seem logical when we consider that under the auspices of a single unit.

But where I sit on my end of the table.

But the point in my comment here is since we do have some differing views and we have Dr. Powers sitting on the other side of the table who expressed those, I'm wondering if we could perhaps, if I could beg the indulgence of perhaps allowing him to have the opportunity -- I didn't tell him about this and I don't know whether he is necessarily prepared for it -- but since there are some differences there, I would like to give him the ability to express what has been termed perhaps the more irrational views.

COMMISSIONER MC GAFFIGAN: Again, I will use my brief Chairmanship here of this particular meeting to welcome this.

I also welcome differing views. I have commented in the past. I know in some of the other ACRS meetings -- there are additional views. You guys never have to say dissenting views. There are additional views.

But I would join Commissioner Merrifield in welcoming Dr. Powers, if he so chooses, to give us his two cents at this point and Mr. Sieber.

DR. POWERS: I think it will definitely be two cents because I'm totally caught flat-footed on this.

I dissented totally with the letter. I thought we were indulging in an examination of the merits of this risk assessment, that risk assessment does not yet warranted.

I question whether it is wise at all to set a particular numerical threshold for advanced reactors. We want to improve the reactors on our sites. And to set a threshold that they must pass substantially different than the adequate protection threshold we set now means that we would forego technological improvements simply because they did not meet an arbitrary numerical guideline.

I had very, very severe reservations about the idea that if we chose to install a modern reactor on a site with older reactors that

we would then have to go through and upgrade the safety of those existing reactors to meet some different standard than that they were designed to. To strain analogies a bit, it would be something like telling the airlines they could not introduce Boeing 777s until they upgraded the safety of their 736s.

I think that would be contrary to the Commission and the public's objectives of having ever safer reactors.

I very much worry about how the QHOs will play in a modern closed fuel cycle. I think that we may have to revisit QHOs.

I see designs for closed fuel cycle in which would have nuclear islands. And if we were to follow the advice in the letter to apply to those, you might have to design those facilities either to be safe beyond technological capabilities or we would disburse those and incur the incremental risk of transporting fuel back and forth between multiple facilities.

I think we need to rethink that if we are going to have a modernized nuclear fuel cycle. Fortunately, it's not imminent.

My biggest concern, though, in the letter was that they were asking for a criterion that can't be calculated. Right now we do not have the technological capability to calculate whether a plant is in conformance with the QHOs.

The QHOs require calculation of risk from all initiators and

all modes of operation. It requires means so it requires comprehensive uncertainty analysis.

My standards are fairly strict on uncertainly analysis, but they pale in comparison with the standards Professor Apostolakis requires for a good uncertainty analysis. And it simply can't be done.

And I really question whether you establish a criterion that can't be calculated.

COMMISSIONER MC GAFFIGAN: Aside from that you thought it was a wonderful idea?

DR. POWERS: It was painful to dissent from my colleagues so quantitatively but there was no aspect to the letter beyond the greetings and salutations and the closing that I agreed with.

COMMISSIONER MC GAFFIGAN: Dr. Sieber, do you endorse what Dr. Powers just said?

DR. SIEBER: Yes, I do.

COMMISSIONER MC GAFFIGAN: Why do you so politely call them additional views when they are so starkly -- aside from the salutation and the signature, why don't they call it dissenting view?

DR. WALLIS: This is the mechanism. This is the process that we have.

COMMISSIONER MERRIFIELD: They try to be as much of a collegial body as we do. I think we shouldn't quibble on that

particular --

DR. POWERS: There was nothing collegial about this one.

COMMISSIONER MERRIFIELD: That comes through loud and clear.

And I would also say much of my suspicions of all the interactions I recollect with you, Dr. Powers, there is certainly a rational explanation for your dissent.

DR. POWERS: Thank you.

COMMISSIONER MC GAFFIGAN: I'm not sure whether it is rationalist -- what's the good word?

Is rationalist better than structuralist?

DR. POWERS: I would point out that there are structuralists and then there are poorly educated rationalists.

COMMISSIONER MERRIFIELD: Listen, I am lawyer. I would use different term for rational. I'm not going to get into this particular scientific quibble.

COMMISSIONER MC GAFFIGAN: I think it's been determined at previous meetings that I am a dyed in the wool structuralist.

DR. POWERS: Good man.

COMMISSIONER MC GAFFIGAN: Okay. We will move

right along from there.

DR. WALLIS: I was wondering if I would be allowed to comment? I disagree with Mr. Kress on this six-pack, eight-pack viewpoint.

COMMISSIONER MC GAFFIGAN: The letter is trying to capture --

DR. WALLIS: But there was a much milder disagreement than you just heard.

COMMISSIONER MERRIFIELD: I note for the record, I think the way in which Congress has attempted to capture Price-Anderson to be inclusive of these modular designs, I think they would agree with more of an approach of combining these as well.

COMMISSIONER MC GAFFIGAN: Okay. We have had our fun for the day.

DR. WALLIS: George Apostolakis is the next speaker.

DR. APOSTOLAKIS: The first item is the draft Regulatory Guide on Fire Protection.

The National Fire Protection Association issued Standard 805 about four years ago that offered the choice of following a deterministic approach to fire protection and probabilistic approach, the rational approach.

The Commission issued a rule, 10 CFR 50.48©) in 2004,

which incorporated this standard by reference. Therefore, now the licensees have this choice as an alternative to 50.48(b).

Of course, the standard does not give details as to how to implement this approach, so the Nuclear Energy Institute issued Report 04-02 that supposedly offered implementation guidance. And the draft Regulatory Guide endorsed this report with some exceptions.

The problem the Committee had with the report is that it was not really risk-informed. If you read the general tone of it was that there was an attempt every step of the way to do a deterministic analysis that would preclude doing risk analysis.

For example, in the second bullet, it says that in the report, there is some advice there that if using the deterministic methods the licensee can show that given a particular fire there is a success path, then you don't need to do a PRA.

And also they use deterministic ideas like the maximum expected fire scenario and the limited fire scenario to judge whether sufficient margin exists.

So the Committee very explicitly stated that if you want to be risk-informed, then you have to do what Regulatory Guide 1174, for example, says and calculate delta CD of the change and core damage frequency in the LERF using methods that are based on risk analysis.

You cannot be risk-informed without risk information.

In the letter we received from the EDO said that the staff agreed with us except for our request that these scenarios be defined. And the argument was that these are already defined in NFPA 805, so there is no reason to revisit those.

And my understanding is that the staff and NEI are working on a revised guidance.

Now, moving on to NUREG/CR-6850. About 25 years ago the first industry response of PRAs for Zion and Indian Point were issued and demonstrated the significance of fire as an initiator of accidents.

Since then, there have been many PRAs around the world that have confirmed that indeed the fire contribution to risk -- that fires are among the major contributors to risks as are earthquakes.

There has been also a lot of good research work on various pieces of the methodology.

There was a need to pull everything together. So the NRC staff and EPRI put together a group that did this and the result is this NUREG report.

They had the work reviewed by peers. There were two pilots that were ongoing. Unfortunately, they have not been completed yet.

The result is a very good piece of work. It offers structure

to the framework for doing a fire risk assessment that has the latest in the state-of-the-art there. It also gives some specific guidance on some items.

It's significant that before they started working, they anticipated there would be some disagreements. So they had established formal issue resolution clauses which evidently they never had to use. So this is good there was agreement.

I'm sure there are disagreements, but they were able to resolve those.

Now, reading the report -- and of course the ACRS recommended that the NUREG report be issued.

There are numerous places where one can disagree with what they say or with some of the numbers that they offer. But I think it would be hard to deny that if a licensee follows that methodology, that safety is definitely improved. It is a very good detailed framework within which risks from fire can be evaluated.

The ACRS would like to see the pilot full scope PRAs be completed.

COMMISSIONER MC GAFFIGAN: Where are those being done? Which plants?

DR. APOSTOLAKIS: I think one was by Duke and the other Exelon.

MR. HYSLOP: Actually -- do you want me to go to a microphone?

COMMISSIONER MC GAFFIGAN: Yes. Yes, you have to. This meeting is being heard over the web.

MR. HYSLOP: My name is J.S. Hyslop. I was the lead fire PRA engineer for 6850 in Research.

There are two pilots: D.C. Cook and the other was Millstone Unit 3. Those pilots are not going to be completed, because of change in priorities at the plants.

We have another pilot ongoing at Nine Mile Point. It's our expectation that they will complete it.

In fact, we are down there this week, EPRI and NRC, providing a technology transfer and demonstrating the methods in an integrated fashion.

COMMISSIONER MC GAFFIGAN: If I could just ask a clarifying question. How long now is it before we have a completed fire PRA?

I mean, if you and EPRI are just transferring the methods, that means they are fairly initially starting this.

MR. HYSLOP: No, no. We have demonstrated all the individual procedures of this process. We are down there now doing an integrated look, a scenario all the way to CDF.

This is our next to the last demonstration. And it's our expectation that they will be done in 2006.

They are also -- there are plants associated with 805 that we are expecting a complete fire PRA with also.

DR. APOSTOLAKIS: Now, doing a fire risk assessment involves a lot of things. You have to model physical phenomenon fire propagation, take into account the geometry of the compartment where the fire occurs, and of course, the response of the plant.

There are many models that have been proposed. And they are listed in the report and so on.

Of course, it's not surprising that there are large uncertainties. Large. What is large?

Well, there are uncertainties in many areas, especially when empirical correlations are used to describe the fire and its consequences.

The report does a very good job discussing the uncertainties and alerting the user that there are uncertainties that they ought to think about.

It offers advice in many places and ranges for numbers and so on.

And again, as I said earlier, one can question some of these and disagree and so on.

But I think this is an excellent first step toward having a very good methodology in the near future.

COMMISSIONER MC GAFFIGAN: Is there any need -- I mean, a lot of the other areas that we have, we have ASME or somebody doing a consensus code.

Is this document good enough to be taken over as the first draft by some code committee?

DR. APOSTOLAKIS: As a first draft, probably. I liked it. The Committee doesn't have a position, of course.

COMMISSIONER JACZKO: Does the Committee have eight positions?

DR. APOSTOLAKIS: No. This is not important enough to disagree.

The last item is the Post Fire Operator Manual Actions Rule.

The licenses have been offering manual actions as alternatives to some of the requirements in Appendix R, which is, of course, a deterministic prescriptive rule in order to demonstrate that they can achieve post fire safe shutdown.

The draft rule was issued for public comment. And many comments were received that were negative.

The whole idea was to reduce the number of exemptions,

of course. I mean, if you have a rule and then you have 1,000 exemptions to it, that probably a hint that's not a very good rule.

COMMISSIONER MC GAFFIGAN: Yes. We have gone down that path before.

DR. APOSTOLAKIS: So there are many comments that were received and they were very persuasive. So the staff was convinced that the objectives of this rule would not be achieved. Namely, that the number of future exemption requests would not go down.

And this had to do with requirements for additional automatic suppression and deduction systems in some areas where now they are not required. And this time lodging factor which was viewed as an additional regulatory burden. That already the analysis is conservative enough, why do we need this additional conservatism.

The Committee agreed with the staff's decision to withdraw the rule. At the very end, there is a small sentence that says maybe there is an alternative approach, you can be risk-informed. Which now with NFPA 805 and this great work that the staff and EPRI have done, maybe it should be considered.

In fact, we heard today that 25 units have decided to do a fire PRA, 23, 25 units, which is a very good development.

Thank you, Mr. Chairman.

DR. WALLIS: The final topic of our formal presentations concerns technical issues with power uprates and it will be presented by Dr. Richard Denning.

DR. DENNING: The most recent ACRS letter on extended power uprates was for Waterford, which preceded our previous meeting with the Commission. So, we actually have not sent you a letter since our previous meeting.

Over the past two months we have been reviewing the application for a 20 percent power uprate for Vermont Yankee. Yesterday we held the full committee briefing. We are currently working on a letter for Vermont Yankee.

Four of the last two uprates, the SCRs have been submitted according to the RS-001-EPU review guide which provides a more structured approach to the EPU review.

I'm going to be discussing some of the principal issues that we deal with on the various EPU uprates, particularly those for BWRs.

The first of the issues that I'm going to talk about is the containment over pressure credit. In a loss-of-coolant accident for EPU conditions, the quantity of decay heat that is transferred to the suppression pool is higher than the amount that occurs under pre-

operate conditions.

If you take a single failure in a loss-of-coolant accident in which the worst one is a failure in the residual heat removal system, then the temperature of the suppression pool under these conservative approximations that are made can reach a level at which the emergency core cooling system pumps could califate, unless credit is given for the elevated containment pressure that you would expect to exist at that time. That pressure would exist unless there is also a containment failure, a failure to isolate the containment that would allow that pressure to go down to atmospheric.

There's no regulatory requirement that says that you can't credit containment pressure. If you take the single failure as the worst single failure being that heat removal system, then there would be no requirement that you will also assume containment isolation failure. That would be a second failure.

There is however, a defense-in-depth issue. If the loss of containment isolation is the direct cause of pump cavitation and severe fuel damage, then the release would occur in a containment that is failed in an un-isolated containment.

So that's where this defense-in-depth element enters in.

The ACRS has maintained the position that credit should only be authorized on a case-by-case basis. And we have used certain

criteria in our acceptance of various cases.

The staff is also developing criteria that would provide a consistent basis for determining whether exemptions should or should not be granted.

The next issue that I wanted to talk about is large transient testing.

There is a GE topical report that provides guidance on post uprate testing recommendations for large transients such as turbine trip, main steam isolation valve closures in which there is a reactor trip and a potential shock to the system in performing that type of large transient test.

Because of that, the shock to the system, the applicants typically propose to be exempted from performing this large transient test, which is an integral test of the entire system in some respects after the uprate.

The ACRS places the burden on the applicant to provide the case for why the large tests are not required. Typically what we see the applicants proposing are limited tests or transients that are directly focused on those things that are changed in the design or in the operation, looking at how is the performance of the system changed.

And those are the kinds of transient tests that they propose and are certainly required.

The applicants then have typically developed arguments as to why the large transient tests are not necessary.

And usually that -- those arguments go along the lines that these types of trips occur accidentally at times and have demonstrated the performance of the systems and that the systems aren't changed that much by the EPU upgrades

(The Chairman came at 1:52 p.m.)

DR. DENNING: Typically The ACRS has accepted these arguments.

The next issue involves PRA issues and EPU applications.

The EPU applications are not submitted as risk-informed applications. It's important to recognize some of the limitations that PRA has in addressing power uprates.

First of all, the surrogate risk measures that we typically use in a Regulatory Guide 1174 type of risk-informed decision can be misleading when dealing with an uprate.

A 20 percent uprate in power sufficient product inventory is essentially 20 percent higher then it was in an pre-uprate condition. Thus, even if the CDF and LERF are unchanged by the upgrade, the risk of latent cancer fatalities is approximately 20 percent higher than in the pre-uprate condition. And the risk from early fatality would be

increased by probably greater than 20 percent because of the threshold nature of early fatality risks.

Another aspect of power uprates that's difficult for PRAs to assess is the reduction in margin that occurs when you go to an uprate condition. In the BWR uprates, for example, the conditions in the peek bundle are essentially unchanged in the uprate.

The way you get the extra power is to spread the power more evenly radially across the core and then also, of course, to increase the steam flow and the makeup water.

Now, the effect of having a number of bundles that are fairly close to the limit rather than a few bundles probably increases the risks to some extent, but it's very subtle and it's not within the capability of risk assessment to determine what that contribution is to increased risks.

Another example is the reduced margin to pump cavitation that we discussed earlier.

Now, one of the changes in risks that we do examine in risk assessments is the effect of reduction in time available to the operating staff to perform actions. For the same reason that suppression pool temperature goes up more rapidly, as we discussed earlier, typically there is less time available for operators to perform critical actions.

Now, we do have methods for human reliability analysis that we can use and do use to assess what's the increase in risks associated with that reduction in time available. That is not the strongest part of PRA. There certainly is a lot of subjected judgment in that.

Although I have mentioned some of the limitations of PRA, RS-001, this guide, does require the submittal of risk information along with the application. And we are fully supportive of that.

The stated purpose of the risk review in RS-001 is to determine if there are any issues that would potentially rebut the presumption of adequate protection that's provided by the licensee meeting the deterministic requirements and the regulations.

RS-001 also provides further guidance. That is that the focus in these cases should primarily be on the base risk evaluations rather than in the changes in risk evaluations, the delta CDF and the delta LERF between the pre-EPU condition and the EPU condition.

Thus, what we do is we look at the CDF and LERF to assure that there is a reasonable margin to the values at which we have concern about the level of safety.

The final issue that I wanted to address is increased flow effects.

Obviously increased power implies increased steam flow.

It implies increased makeup water flow. And that also implies increased velocities in some components.

One potential effect of the increase is flow accelerated corrosion. This is an area requiring increased surveillance.

Increased flow can also result in increased vibration and the potential for fatigue failure of components.

Steam dryers are the obvious focus of concern because of the failure that occurred at Quad Cities after the uprate. We believe that the conditions that led to the failure of Quad Cities are now understood. Apparently a natural frequency of the steam line matched the natural frequency of structures in the steam dryer. And a resonance was established and led to that failure.

There are methods of analysis that are available that can explain those results that happened at Quad Cities. And they provide insights as to the conditions under which a similar resonant behavior could occur.

They do, however, have limitations as to their predictive capabilities.

So we know to look closely at the steam dryers, and we can identify some components that should be examined such as the steam separators to make sure that there aren't similar potentials for resonant behavior there.

But the state-of-the-art of those analytical techniques is limited and it's difficult to predict in a predictive manner a problem that's going to arise. So that's why surveillance and inspection are a particularly important part of achieving the type of assurance that we are looking for.

Now, that completed my presentation on the EPU issues.

DR. WALLIS: Mr. Chairman, we have finished and just slightly ahead of time.

CHAIRMAN DIAZ: Thank you very much. I'm sorry I was delayed at the Hill. I, of course, had the opportunity of reviewing the testimony.

I was glad I came at least at the tail end of Dr. Denning's statement. I think I'm just going to sit back here and enjoy myself with my fellow Commissioners.

COMMISSIONER MC GAFFIGAN: We have had great fun in your absence, I should say, and probably violated at least four rules of procedure.

CHAIRMAN DIAZ: Duly noted. Okay. All right.

With that introduction, Commissioner Merrifield.

COMMISSIONER MERRIFIELD: Thank you very much, Mr. Chairman.

I think I will start off with Dr. Wallis. I appreciate your

presentation of the overview of the many issues that you all are working on.

I noted in future activities, I think I got my count right that there are actually 20 that you have listed here. They are in alphabetical order.

I don't think we have the time, certainly in my limited time, to go into each and every one of those and what the risk priority would be of those.

I guess I would make more of a comment. And that is obviously, the most important issues are those for which we have a statutory responsibility and those which most critically affect our mission of protecting public health and safety.

Clearly, however, given what is going on in the nuclear arena of which we oversee, there is the potential for an extraordinary amount of work for the Commission as a whole and ACRS in particular to review new reactor designs and perhaps an avalanche of reactor orders.

Given the top 20 list that you have got, I do want to have -- if you can give me a brief insight in terms of how we can collaboratively work together to make sure you are focusing on the core issues and perhaps how the Commission might help you in terms of perhaps freeing up a little bit of time given the other work you are going

to be presented with.

DR. WALLIS: Regarding priorities, we have a retreat in January. I think one of the major items on that agenda is to discuss how we are going to face up to all of these things we have to do, which things require the greater urgency, what resources we have, how we are going to go about this.

I can't give you the results of that discussion until we have it. But we are very much aware that we have a lot of work coming down the road and that we have to focus on the more important issues.

Regarding how we work together, I think one of the mechanisms which works very well is for me to meet with you and to tell you what we are doing and for you to tell me what your concerns are.

I think that's a pipeline which is always open. And there are other ways. But we are ready to work with you any time.

COMMISSIONER MERRIFIELD: Good. Well, I think -- like I said, I think it's an extraordinary amount of work. It's one, you know, we as a Commission have challenged our staff individually and through the Chairman to come up with innovative ways of thinking about how we may handle these issues on our side of the table. And certainly we will have to engage that way on your side of the table as well.

A very quick comment directed towards Dr. Apostolakis. I

appreciate the review of the fire protection efforts. We did have some comments from the staff on NFPA-805.

As one who was very engaged at the Commission level on that, on trying to get that to happen, I was very appreciative with hearing that we have got 25 units that are going to be seeking a fire PRA. And so I appreciate all the work that you put in to helping us out with that. I think that is clearly a success that we can all share in this as a Commission.

The third issue we have, one of the subcommittees of ACRS recently traveled near my home state of New Hampshire to talk to some of the issues of Vermont Yankee.

Obviously it's not appropriate in this meeting to get into the substantive discussion of the content and recommendations where you all will be going. It would be useful for my purposes to get some sense of where you are in your analysis, when you think you are going to be sending those recommendations on to us.

DR. DENNING: That's very difficult to answer today and will be very clear tomorrow.

COMMISSIONER MERRIFIELD: As they say in Britain, you can ring me up and let me know tomorrow.

DR. DENNING: We would be glad to do that. It could be as late as Saturday that our deliberations are occurring. But there is

always a possibility that we will not be able to issue a letter during this time.

DR. WALLIS: It would be very clear tomorrow, if we agree.

COMMISSIONER MC GAFFIGAN: You will have snow to snow you in tomorrow.

DR. WALLIS: We are staying until Saturday, so we will be all right.

COMMISSIONER MERRIFIELD: Get the cots out for them.

I think it is not that often that ACRS has gone out as of recent. And I would be interested at some later point after you had an opportunity to go through your recommendations and get yourselves together to get some sense of how that part of the process went as well.

So hopefully you can report back to us in that regard.

One of the issues that was touched on today was the generic letter on grid reliability.

There was a letter dated November 18th to the EDO where you all agree with the staff recommendation to issue the generic letter on grid reliability.

I guess my question, one of the issues that has been

raised in having reviewed that generic letter -- there are some very interesting and penetrating questions that are included within it. But I think there's one school of thought that there's a lack of understanding of what we intend to do with it.

We are casting a very wide net of questions, which I think is sometimes appropriate to do. But the question is once I get the data, how does one fashion it into something that is going to be meaningful for the agency actually taking action?

Do you all discuss that in the scope of that meeting? And if so, what were some of the observations?

DR. WALLIS: You are asking a question which is almost exactly one of the questions that we asked at the time of the staff.

Dr. Sieber, or Mr. Sieber is the one who wrote the letter or who was our lead person.

COMMISSIONER MC GAFFIGAN: While he comes to the microphone, could I just pile on in the sense that the other issue that comes up is our knowledge of what's happening in INPO, FERC, EPRI, et. al, partly as a result of the Energy Policy Act of 2005.

You are not the world's experts about some of that. You are the world's experts about a lot of things.

Did you have any conversation about the context for this generic letter?

MR. SIEBER: Actually, in my preparation to have our deliberations on it and the preparations of our report, I ended up having to do a lot of work researching what FERC and NERC has done and the standards committees, because it seemed to me initially that the NRC was ahead of the game, would issue a generic letter that licensees would not be prepared to answer in detail, and be faced with the possibility of having to reissue the letter a year from now when FERC and NERC have established their independent regulatory agency and all their procedures.

And as I looked at the coordination that was taking place between the staff, the NRC staff, and the people at FERC and NERC, I became more comfortable with the fact that our staff is well connected to the situation and that they will get valuable information out of the process.

To me, the generic letter serves an important purpose for the Commission. That being to prompt licensees to push for a good organization coming out of FERC. And it's not clear that that will occur because there will be other organizations besides NRC licensees involved in that process.

But in order to get the assurance that we comply with the regulations that talk about off-site power sources, I think this work has to be done.

One of the concerns I had was the fact that as an industry, the margins are getting smaller because of infrastructure that is not being built as fast as demand is being built. And that will have to be addressed.

I do now think that with the new Energy Act of this year, that the tools are in place to enact an improvement. And, of course, I come down on the side of supporting what the staff has done in the issuing of the generic letter.

So I think that we are in the right place on this issue.

COMMISSIONER MERRIFIELD: Just a quick follow-up, if I may.

Do you think there's any -- because I think there are some questions out there as to what the staff is attempting to accomplish.

Would you see some utility in -- forgive the pun -- utility in having various participants get together in perhaps a workshop to talk about what is meant by the letter and perhaps provide some greater explanation of the direction we intend to go with that?

MR. SIEBER: I think a workshop would be an excellent idea. I think it has to be originated by the staff.

I think that we have to wait until FERC -- at least three months anyway from today, until FERC finally gets the fundamental structure in place to do that and utilities realize what the independent

system operator, what function he will take, what tools they will have, what the interfaces will be.

But I think that is an excellent idea.

COMMISSIONER MC GAFFIGAN: Could I clarify that last remark?

Are you saying that the licensees will not be able to answer some of the questions posed in the generic letter until at least three months have passed?

Because it gives us a breather to have workshops or whatever. Or did I misinterpret the remark?

MR. SIEBER: I suspect that there may be some licensees in that position. But you have to understand, as I have learned, that the different regional coordinating agencies, for example, PJM that serves this area. Some are better than others.

I happen to live out west, and they are still arguing on whether they want to have one or not and who wants to get their electricity from Bonneville and who wants to get it from North Washington Energy.

And so, it depends on where you are in the country, how well organized they are, how well the interconnection agency is controlled, what tools they have and what degree of communication.

So some licensees will be able to do it. Others will need

some help.

And that's why the workshop, an industry workshop for nuclear people would be a good idea so that those licensees who are struggling a little bit would learn from their peers what actually can be done by good transmission system operators.

CHAIRMAN DIAZ: Thank you, Dr. Sieber.

COMMISSIONER JACZKO: Just a follow-up. But you are not suggesting that we delay that generic letter until that workshop happens in three months, are you?

MR. SIEBER: No. When I finally wrote our draft for ACRS approval, I had come to the conclusion that issuing it now was the appropriate thing because I think it's important to keep moving on this.

If we delay and wait for somebody else to start the job, I think that will be a costly delay. And so I came away with the feeling that now is the time to issue the letter, get the process going.

CHAIRMAN DIAZ: Commissioner Lyons, I think, has a question.

COMMISSIONER LYONS: I just want to make one comment, if I could, perhaps more by way of a question.

I understand that in the past on this general subject, there have been meetings where NRC and FERC have sat together to

discuss issues.

I'm wondering if you have any thoughts, Mr. Sieber, as to whether this issue is one that would, again, prompt a rationale for such a joint meeting?

MR. SIEBER: Well, I've learned about the interactions between our staff and the FERC staff through basically trade press and memorandums as opposed to actually being part of it.

On the other hand, I think that the coordination goes deeper than just having a meeting. There are NRC staff people that are actually in a coordinating role with FERC. There is a memorandum of understanding. There is NRC staff that is a quasi member of the NERC standards committee.

And so, all of these things, I think, are ongoing, and I think the staff is dealing with it at the right level and intensity.

COMMISSIONER MERRIFIELD: Not to belabor this, I would -- you can sit down. This isn't related to you. Thank you.

I would layer on top of that we did have a meeting in this room with FERC a couple of years ago, I think, two years ago.

They have been working hard. They do have their ERO Energy -- help me here -- Electricity Reliability Organization. It was encompassed within the Energy Bill; that they are working on right now.

There may well be a time, and I think it may be useful for

the Chairman to have a discussion with folks over at FERC to see whether perhaps you want to think about having another meeting perhaps later in May or so to go over where we are and where they are in these efforts to make sure that we have that energy security we all seek.

CHAIRMAN DIAZ: Thank you. Commissioner Jaczko.

COMMISSIONER JACZKO: I have a couple questions. The first question to Dr. Apostolakis.

You posed the question and then didn't answer the question about what are some of the uncertainties that we see in some of the fire PRAs, the fire modeling.

Can you talk about what some of those are and talk about what the size of those uncertainties are?

DR. APOSTOLAKIS: Well, in the physical modeling of a fire, for example, one can use different approaches.

One is, for example, to go with the so-called zone models in a compartment.

It is very difficult -- let's say there is a fire in this room. It is very difficult to solve exactly the equations given the geometry that you have here and the various combustibles, and so on. So you have to resort to approximate models.

One approach, for example, is to use the so-called zone

models where you basically divide the room into two zones. And you have the hot gas layer and then ambient temperature below.

Now, that is an approximation.

And the problem there is that the uncertainties that are introduced have to do with the model itself. And these are very difficult to evaluate.

In other models, we model the fire as a cylinder, for example, that radiates, and there is the hot plume. So again, these are approximations.

In the report, the joint EPRI, NRC report there is a cone of 35 degrees and so on.

These uncertainties in my mind are difficult to evaluate.

On the other hand, the report offers a methodology where they say you have to do certain screening. Of course it's based on judgment, whether some uncertainties are important from the risk perspective and so on.

Another important area is human actions during the event. Again, the report offers suggestions what to do and so on. But as was said earlier, human reliability models are probably among the weak parts of the PRA.

COMMISSIONER JACZKO: The EPRI – they picked their model. As you said, they essentially set a cone?

DR. APOSTOLAKIS: Yes.

COMMISSIONER JACZKO: They have picked a particular methodology or modeling assumption for the fire --

DR. APOSTOLAKIS: In some places they do. In other places they say, here, different ways you can do this.

The report does not say this is the way.

In fact, I was a little surprised when I read that.

COMMISSIONER JACZKO: Surprised in what sense?

DR. APOSTOLAKIS: That they said there are alternative ways of doing things.

For example, in the human reliability area, Athena is just one of the models. But Athena has been under development here for more than a decade. So maybe there was some policy that was established that -- of course, that makes it a little difficult for the user, because then the user has to -- that's why it's so important to see these pilots completed. It really is important to see that.

In fact, maybe after the 23, 25 PRAs, we will have a much better idea of what is going on.

On the other hand -- if I may?

COMMISSIONER JACZKO: Sure.

DR. APOSTOLAKIS: From day one, 1981, when the Zion PRA was issued, people have been saying that the uncertainties in the

external event analysis, fires and earthquakes, are so large compared to the internal event analysis that you cannot put them together with internal events.

I disagree with that.

The fact that the uncertainties are large, that's the way it is. We don't make that. That's the way it is. That's the state-of-the-art.

CHAIRMAN DIAZ: This is an important time in history. I do happen to agree with Dr. Apostolakis.

COMMISSIONER MC GAFFIGAN: Mark that down on 2:19 p.m. on December 8th. My birthday.

(Laughter)

COMMISSIONER JACZKO: You mentioned that -- and I won't get into what the size of the uncertainties are, because it seems size is not really where we are at a point to be able determine sizes in the uncertainties.

I guess the question becomes: How effective are these models, then, in allowing us to kind of make the regulatory decisions that go into NFPA 805 and all these things?

DR. APOSTOLAKIS: Two comments on that.

First of all, the regulatory decisions are supposed to be risk-informed, of course.

COMMISSIONER JACZKO: That's risk information

comes from the fire modeling in the PRA.

DR. APOSTOLAKIS: Right. I stress the word "informed." That you are not basing your decision on these results.

I think if a lot of these PRAs are done, we will start having a pretty good idea of what kinds of uncertainties we are talking about. So then the regulatory decision-making process will be easier.

The other thing, though, is what I said earlier. Again, you look at this report, and you open it at random. You say, oh, they say here that the probability of this is .05.

It is not .05. It's something else and so on.

But if you look at the whole report and the licensee implemented it, I think it would be extremely unreasonable to say that safety has not improved. Because they go into such detail about smoke, about circuits, about this, human actions.

I mean, you get the warm feeling that really we are doing something useful.

COMMISSIONER MERRIFIELD: Again, no pun intended.

DR. APOSTOLAKIS: It is not my day today, is it?

(Laughter)

COMMISSIONER JACZKO: If I could ask one more brief question.

DR. APOSTOLAKIS: One very last thing. Earthquakes,

too. The uncertainties were huge. But they were huge on the low side.

I mean, again, going back to the early PRAs, you could have a high percentile, perhaps of the distribution of the core damage frequency, ten to the minus four, ten to the minus five. Then it would go down to ten to the minus twelve.

People say large uncertainties. Yeah. But who cares about the low side? It is the high percentile that really matters.

So maybe saying large uncertainties is not the whole story.

DR. WALLIS: It only looks large on a low scale.

COMMISSIONER JACZKO: If I could ask one brief question. This goes to some of the future activities.

One of the issues that I think we continue to work through here is with the PWR sump performance. You mentioned that as something for your future activities.

Maybe you could just very briefly describe what kinds of things you are doing there and you could mention if you are tracking what the staff is doing particularly on the some of the chemical –

DR. WALLIS: We are waiting. We get partial information, which is not really suitable to work with.

We hear that experiments have been done at Argonne which begin to show this and that. But until it's put together, it's

premature to reach a conclusion.

What we ask the staff to do last time we met when they gave the subcommittee a progress report about some of these tests, we asked when is it going to result in something which engineers can use to make predictions. I mean, it is all very well to look at what phenomenon you can discover.

We were very eager to get this to mature to the point where something could be predicted that was useful. And I think that is what we going to look for.

We are not sure whether they have reached that stage yet in terms of the research.

Now, the other side of it is what has industry been doing. We need to hear about that as well.

I think one thing -- the industry is also doing research. And the question there will be, is it comprehensive enough to have established this technical base where you can make these engineering and regulatory decisions.

CHAIRMAN DIAZ: Thank you so very much.

Commissioner Lyons.

COMMISSIONER LYONS: I certainly continue to greatly appreciate the work that the Advisory Committee is doing. I appreciate the incredible amount of hard work you are doing and the volume of

work you are doing on everything from ESPs to the research reports to many of the other applications. So count me as a very large fan.

The first question I wanted to ask really is going to end up looking very similar to the one that Commissioner Jaczko just asked, but I was going to come at it in a somewhat different way.

You are now evaluating some of the research efforts and providing your perspectives on that work. One of the ones you looked at last year was the sumps. And that is an area where you expressed some fairly significant concerns, in reading your report, with the quality of the research, whether it could be better focused, et cetera.

So I was going to start with both a general question but then a specific one which will get to Greg's point. In general, I'm curious whether the Committee has identified follow-up mechanisms in cases where the evaluation of a research effort indicates some deficiencies? I'm curious whether there is a plan to come back to it.

And then specifically in the case of the sumps, perhaps I could use the same phrase, it is continuing to be a very, very hot issue, I guess I personally would hope that that would be one on which you would devote considerable effort both from the standpoint of simply debris concerns but also chemical concerns. And both of those were part of your review in, I guess it was fiscal 2004.

So it's both general and specific.

DR. WALLIS: We will certainly review what gets done and what gets reported to us.

In response to your first question about following up on the research and learning the lessons from our comments and then what to do about it, I'm tempted to say that's the job of RES. And they did respond.

They sent people out to look at the tests and reach their own conclusions and to see if what we said was valid or not.

They actually found some other things which we hadn't found, which I think were important about that work.

We have to play our role. They have to play theirs.

And we try to help out. We review. We don't manage what they do.

Am I being helpful or not here?

You see what I do. We have to play the right role here.

And I think in the case of this, until we get some hard information, which the staff wants to stand behind, we can't really evaluate it.

DR. POWERS: It's fair to say in this particular area that the staff has been very forthcoming in telling us how they responded to us and responded immediately.

COMMISSIONER MC GAFFIGAN: That's in the research

issue?

DR. POWERS: Yes.

COMMISSIONER MC GAFFIGAN: And the quality of the research program. But my understanding is the staff has not, despite the answers to the generic letters having been back in for some period of time --

DR. WALLIS: Maybe it's a tougher problem than they thought it was.

COMMISSIONER MC GAFFIGAN: Right. But they haven't briefed you at all about the licensee response to the generic letter?

DR. WALLIS: No.

COMMISSIONER MC GAFFIGAN: And I don't know how many months it's been.

COMMISSIONER LYONS: Well, just from the effort that I put in in visiting the work at UNM, because I was very interested in it, and there was a recent seminar here on this, certainly the staff is doing a lot. I'm most appreciative of that.

It's also an incredibly complex problem and one which I think may have pretty substantial implications.

I guess maybe you could just have my vote that this ranked reasonably high in your prioritization as you look at subjects for

the next year.

DR. WALLIS: Thank you.

Since it falls into my subcommittee, it certainly is high on my list, too.

COMMISSIONER JACZKO: I would certainly agree with Commissioner Lyons that it certainly ranks high on my list as well.

COMMISSIONER MC GAFFIGAN: It ranks high on mine.

CHAIRMAN DIAZ: I think we just voted.

(Laughter)

COMMISSIONER LYONS: I'm almost out of time. Can I ask one more quick one?

CHAIRMAN DIAZ: Go ahead.

COMMISSIONER LYONS: One of the other subjects that I was very interested in was the review of the research on digital INC, which certainly is going to be a subject that is going to be -- will be coming before you and before us and I think will be a major challenge.

Two particular questions.

There was a comment in your review of this work suggesting that the staff should be more system centric than software centric. I was curious if one of you could add a sentence on what was meant by that?

And then I'm also curious in general if in your discussions

with the staff if you have formed an opinion as to whether as an agency we are well prepared to deal with the challenges that are going to be raised by digital INC, or if we need to be further strengthening that area?

DR. APOSTOLAKIS: The analysis of the evaluation of the reliability of digital INC has been a problem not just in our industry, but out there. And the root cause, the heart of the problem is that the kinds of failures you have there are what we call in a general sense, design errors; specifications, requirements and so on.

Now, if you look at the traditional reliability methods, they don't deal with that. We don't deal with design errors in PRAs, for example.

So when digital software came, a lot of people just took the models from the existing theories and they just forced them on digital INC.

Then there was another group or another school of thought that said you can't do that. And so you have now two schools of thought. I'm with the guys who say you cannot do it.

But I can see that the others may have a point too, unlike the structuralist people.

So what do you do then? I mean, if you follow the traditional approach, then, of course, you treat the software like another

component. And you say, okay, so this pump has this failure rate and digital pump has this other failure rate.

And that you can say is the software-centric approach. That you are treating it as a component.

In the systems approach, you are saying I don't care what -- well, I do care, but I mean, I'm not going to try to find the failure rate of the software. This is part of the system.

So, you know, if the system is controlling the water level someplace, then what my interest is isn't the level of the water. Okay. So I will work back now and I will embed the digital part in the fault tree, for example.

Now, it is not obvious how do you that, and it's not straightforward. But that's the system-centric approach.

In other words, don't forget that your objective is how the system behaves, which has the software embedded in it.

We just wanted to stress that fact to the staff. The staff was aware of it. We had discussed it with them.

The significance of it, we really wanted to stress that in our report.

So we will see. It's a very difficult issue, by the way. I don't think -- I mean, we are not just telling the staff, hey, guys, you didn't know this and everybody else knows. Nobody knows how to do

it.

But at least if you take the right approach from the beginning, we may get somewhere.

And the other thing, of course, is that a lot of our digital software so far have been simple. Sometimes people are overwhelmed because they read about the – failure in Europe and so on.

They are using their software to actually control. And we are just using them just to monitor or actuate systems. We are not really that sophisticated yet. Although with advanced designs, we will be.

COMMISSIONER LYONS: We will be.

DR. APOSTOLAKIS: Yes, we will be.

That is what was meant by software centric. Fancy words always attract attention.

CHAIRMAN DIAZ: Thank you so very much.

I think I need to start with a couple of comments first. I occasionally joke with Dr. Apostolakis. That is a sign of my respect. I wouldn't joke with him if I didn't have the highest respect for him.

The fact is I remember when I was a very, very, very young dean for research in California, and Professor Apostolakis was a senior professor. And I always looked up to him.

(Laughter)

CHAIRMAN DIAZ: The second thing, I think there is something that keeps coming around, and I think it is important that we again focus on what risk-informed is. It's the fact that we don't make regulatory decisions that are based on one factor.

Risk informed, and this was a decision of the Commission made years ago, is an expert combination of experiential, deterministic and problematic methods. It's how to put that together that is always a good test of the ACRS, the staff and the Commission's capability at the end to make judgments. I think we continue to progress on that.

But it is important that we realize that there is not one thing that we can put all the weight on it.

And I do appreciate the fact that when you put all of these things together, the bottom line of everything that I have always seen is that safety is improved. And that is what the Commission is looking for, and that's what we are achieving.

Sometimes people say it's the margin in here. But the reality is that even by looking at it, we know better, and safety is improved.

That's just one comment.

Having said that, let me just get a couple of points in here. I understand everybody has commented.

I do agree that it would be important how the Committee

plans the work for the upcoming new licensing framework and the differences that we are now seeing in the, from what we thought was going to be certain type of approaches, the approaches have changed. Planning your work will certainly be very helpful to the Commission.

On the issue of new plant licenses, a very specific technical question is -- I really was a little lost when I look at your letter, is the recommendation to use large release frequency rather than early release frequency.

Maybe it's subtle, or maybe it's not subtle at all, that I missed. And maybe someone wants to dwell a little bit on it.

DR. KRESS: I would be pleased to comment on that.

The large early release frequency was introduced as a surrogate for the prompt fatality safety-goal, quantitative safety-goal. It is not a very good surrogate, by the way. And it is only applicable for light-water reactors.

Now, if we are now going to a system where we are asking for enhanced safety and design, the question is: Should we continue just using large early release when the regulatory system is concerned with any release, late, early, even smaller releases?

In my opinion, a better choice of a safety metric which would include large early release would be a conditional containment failure probability. You have to properly define that because some

containments are vented and some containments are confinements.

But properly defined that would be a better metric.

The large release frequency includes large early release and it includes some -- includes all late releases. It doesn't include small releases.

So I personally would have preferred the conditional containment failure probability because it contains any kind of failure. It incorporates the large, the late.

And I think we are interested in actually preventing any release. That's why I would call that a better metric.

COMMISSIONER MC GAFFIGAN: Mr. Chairman, as a matter of information, we will tell you that one of the places where we went slightly off procedure -- and it was Commissioner Merrifield who led us, but I was happily led -- Dr. Powers earlier in the discussion made it clear to us that the letter that you are looking at, he agreed with the salutation "Dear Mr. Chairman" and the signature, and nothing in between.

I commend to you to maybe look at the transcript for that rather than repeating it now.

CHAIRMAN DIAZ: All right. I will certainly –

COMMISSIONER MC GAFFIGAN: And Mr. Sieber heartily agreed with Dr. Powers.

CHAIRMAN DIAZ: And I should look at the transcript.

DR. KRESS: Keep in mind that the letter was passed by the Committee.

COMMISSIONER MC GAFFIGAN: That's fine.

CHAIRMAN DIAZ: I understand.

You know, sometimes in these meetings, we get a snapshot of something. One of the things that the Commission has been dealing with the last four years is the, in the time domain when something is going wrong, it's a fact that the longer the amount of time, the more things you can do to prevent it. And that might not be included in a conditional probability.

And so, therefore, there are issues that are beyond just that calculation, which actually will impact on how we will assess the safety of a facility, the capability to mitigate, a significant amount of learning has taken place and work has been done in that arena which will actually play into this issue.

I think I understand the mathematics of it. I like to sometimes think that we need to put these things in a time domain to again get a complete picture, because the picture is not complete unless you look at what the mitigation capabilities are as time gets longer and longer.

And I do believe that in this country, we will not let a

containment failure have a significant amount of time. There are many things that we can do about it.

I will read the transcript. Am I over? It's your fault.

COMMISSIONER MC GAFFIGAN: I think that you should take the prerogative of the Chairman if you have one more question do it, everybody else does.

CHAIRMAN DIAZ: Let me tackle another issue that was mentioned.

In fire protection, I know that we have good responses. We got 25 right now. It was 23 last week.

DR. KRESS: I think it really is 23.

CHAIRMAN DIAZ: Twenty-three. That's certainly good.

But looking at the fire protection issue, the fact that the Commission has been really trying to hammer at this issue. As you look at it from the standpoint of what are licensees doing, what are the new rules, is there something else out there that we are missing, that we should be doing? Is there something else in the fire protection arena that really needs to deserve, or deserves a very serious look? Or are we in a comfort zone?

We have looked at enough things, the staff has looked at enough things; we are going the right way?

COMMISSIONER MERRIFIELD: Mr. Chairman, are we

ever in comfort zone?

CHAIRMAN DIAZ: I remember one time.

(Laughter)

DR. POWERS: I think that fire protection -- fire protection is a very interesting field, because it's only very recently entered into the risk-informed world in the quantitative sense.

It is very clear that fire protection engineers have worked on risk all along, but they have worked in a qualitative sense. And now that they are being injected into the more quantitative risks, they have to look to their tools to do that quantitative analysis.

And what you find is that the tools readily available to the typical fire protection engineer and even the inspectors at our nuclear power plants are relatively bounding kinds of analyses.

And if we are going to try to quantify some of these risks to the point that you can make decisions and actions and changes to plants and make decisions about those things, I think we will find our analysis tools are relatively crude that get used now.

Dr. Denning will make the point to you that if we move to the non-nuclear, world much more sophisticated types of analytic tools are used for things like fire propagation. And certainly we could adopt those.

But we are going to have additional problems when we go

to saying, gee, how does equipment respond to these fire insults? And when we look there, we find we have relatively incomplete experimental data, relatively incomplete analytical capabilities to understand how equipment responds to a fire insult.

That kind of detail the fire protection engineer has historically integrated the heat transfer equation in his head based on experience, to make judgments.

Now, when you turn to making more precise analyses to incorporate in a larger whole, I think that cranial integration is not going to be adequate.

By going to point to an area where I think the Commission needs to look further, perhaps it would be in those areas of the tools we make available. That may become even more critical if we have a flowering of the nuclear industry and we are bringing in less experienced people to carry out their function who may well have to rely more on the quantitative tools than the cranial integrations.

CHAIRMAN DIAZ: Okay. Commissioner McGaffigan.

COMMISSIONER MC GAFFIGAN: Thank you, Mr. Chairman.

I'm going to spend my few minutes on the priority issue, or at least the last number of them.

For those who -- why do I only get three?

CHAIRMAN DIAZ: He gets five. He is still on the first.

COMMISSIONER MC GAFFIGAN: I'm only on the first round.

They have been trying to shortchange me since I've been back. There is a pattern developing here.

COMMISSIONER MERRIFIELD: All these clarifying questions you have been asking takes away.

COMMISSIONER JACZKO: I think you are still already over five.

(Laughter)

COMMISSIONER MC GAFFIGAN: For the public I wanted to understand that the word "structuralist" when used by most members of the ACRS is a pejorative term akin to --. And just so people understand, rationalist means you are saintly and God-like and whatever.

Those who are structuralists, which I think I count myself, tend to think rationalists are people who wave their hands an awful lot and always fall back to risk-informed. So we are not really using -- it's not really risk-based. You can fall back on your judgment when you get the wrong answer from the PRA.

But whatever. And that has happened. I mean, that has happened in the history of the Commission, recent history of the

Commission, colorizing the Davis-Besse event took the staff an enormous amount of time. Anybody who was a structuralist knew it was red from the first moment. But the rationalists worked their models and worked their models and worked their models, and they eventually got to red.

I'm glad they did. I commend the senior staff for making sure that that happened. But it took an inordinate amount of time.

I tend to think of structuralists as saintly and rationalists as a pejorative. But whatever.

Let me get to the prioritization. I do endorse the comment made earlier. GSI 191 is a very important activity for you next year. That's partly informed by this recent work by EDF looking at the backfits that they have committed to the French regulator that haven't yet been fully approved, but the single largest contributor to risk reduction or safety was their plans to work on the size of the sump strainers at the -- I guess these are 900 megawatt series plants.

And so there's an opportunity there. There's an issue that they don't have any chemical data any more than we do. Perhaps chemical issues have to be solved with chemical solutions rather than engineering solutions.

We will get to that. It is an important area.

The other area that I think is terribly, terribly important,

and I urge to you do some strategic thinking about and talk to the staff about it and talk to the Commission is the new plants. Commissioner Merrifield said that.

We are going to be working over the next 18 months on at least four or five parallel trains, some of which involve you; most of which should involve you, some of which don't. And all of which are going to be vital and schedule dependent.

One is the Standard Review Plan. And I think you should be involved in looking at that speaking as one Commissioner.

Another is the Reg Guide -- excuse me, the content of the COL application. I mean, you guys are going to be reviewing these things in your role, your statutory role.

And the content of the COL application, I think it is an NEI submittal that the staff is going to comment on. And as the Chairman said, there's -- we are going to have -- that content of the COL application is going to be dependent on whether you have an ESP, whether you have a certified design, whether there is a parallel certified design process underway.

It is a complicated document. And the industry would like us to have it yesterday.

We have the 73.55 security rulemaking that is absolutely vital, that we are supposed to get in the spring. And it is a proposed

rule -- in May, I guess that's still spring.

There is the Chairman's discussions about multinational design approval and what that may or may not entail. But it gets to issues like QA and codes and standards and rationalizing rules across the globe.

And there's also this Part 52 element which in my mind may be the least important.

But you need to think through structurally -- strategically where you are going to put your resources. Help us figure out where we are going to put our resources, which of these things are more important than others.

I think that's the single-most important thing, looking forward. I think GSI 191 is the single-most important thing looking now.

That's my input, for what it's worth, in your prioritization process, which means you are going to have to shed things.

I agree with the opening statement I read on behalf of the Chairman. There are some thing that are going to have to be shed, and the staff has to be reluctant to bring you into things that are marginal.

If the staff is asking you to do something which you know on its face is marginal, I think you have to come to us and say -- or go to the EDO first – and say we don't think this rates. In the scheme of

things, this just isn't worthy of our time. If it were a slow period, sure we could have done it. But not now.

CHAIRMAN DIAZ: Thank you, Commissioner McGaffigan.

We have another round and three minutes is ideal. We will start with Commissioner Merrifield.

COMMISSIONER MERRIFIELD: I think the last question, Dr. Powers, you talked a bit about the work being done by Research relative to 50.46, the 50.46 rulemaking.

I'm sorry. You were talking about the work that Research was doing in this general area regarding 50.46.

Do we need this to do a rulemaking? Is this something you think is necessary toward getting us to a Reg Guide? Does one necessarily flow from the other?

DR. POWERS: You need to change your rule. But it's an easy rule change in my mind. You need to change the rule to say thou shalt have a coolable core at the end of a design basis accident.

You need to change Reg Guides to respond to what the industry brings on as new cladding, new fuels and that like.

And staff has done the research that you need to do both. This is an easy one.

COMMISSIONER MERRIFIELD: I didn't frame my

question very well.

We have got what we need to go forward with the rulemaking?

DR. POWERS: I think the staff has produced a piece of research that you can act upon now.

COMMISSIONER MERRIFIELD: Okay.

DR. POWERS: I think they have done an excellent job.

In fact, I would just comment that the entire fuel research program is extremely well organized and well conducted. It makes very prudent use of the available resources by leveraging themselves with the worldwide community and with industry to the extent they can.

I think you can be proud of that piece of research.

COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman.

COMMISSIONER JACZKO: I actually don't have any other questions.

I just maybe would follow up a little bit on some of the talk about where we are with the some of the sump issues.

Dr. Wallis, you mentioned that you are waiting to hear some things from the staff before you can formulate an opinion. Right now everything is just kind of a gelatinous blob in some ways, looking for somebody to put some molds in there to get something solid out. I

guess there is no pun intended there either. Chemical effects.

You know, I want to say that I certainly think that the staff is doing a good job in working on that program. I think it's a very complicated issue.

I think we are certainly looking to try and deal with some very complicated issues. And I think in many regards we are probably much farther on front than the industry is on that. I think in some ways that is probably an unfortunate thing.

I think we tend to be better when the industry is a little bit more knowledgeable about some of these technical issues -- I wouldn't say knowledgeable, but has a better grasp of some of the implications of those.

I certainly didn't want to leave the impression that the -- I think the staff is moving forward on an aggressive program. I certainly hope they continue that.

And I look forward to getting some more concrete things that they can present to you to hear your thoughts on that.

DR. WALLIS: I think also we have been doing nothing but have been thinking about the problem. But we haven't reached the point where we can say there's any conclusion from it.

CHAIRMAN DIAZ: Commissioner Lyons.

COMMISSIONER LYONS: Question for Dr. Powers, I

think.

When you and Mr. Sieber put together your DPO, for lack of a better word, you included a phrase that I found very, very interesting. And you said the goal should be, then you said to routinely do risk assessments of sufficient scope and depth so it is possible to dispense with surrogate metrics.

To the extent I understand that statement, I very much agree with it. That our goal needs to be to continue to improve our risk assessment methodology.

I'm just curious if you or maybe others feel that we are continuing to advance that frontier or have we stagnated?

DR. POWERS: I think I can only offer a personal view that maybe isn't supported by a huge amount of investigation, but anecdotal account.

I think we are stagnated now. I think that we have reached a point where we can do internal events rather well for level one.

And I think the next step to go beyond that and start looking at things like fire PRA, at shutdown PRAs, quantify external events of seismic nature and things like that is a slow step right now.

We don't see the development of methods going on as aggressively as it was ten years ago.

And in part, we get so much from the more qualitative approaches to these things that we are still digesting those. But I think for advanced plants, the point we were trying to make in our descending opinion, that if you are looking for safer advanced plants, you want the quantitative tools so that you can identify those systems, components and structures where you are going to devote your safety attention to.

That means being able to do risk achievement work and risk deduction work. And I can't do that with qualitative results.

I think that was the point we were trying to make there. That we were more interested in being able to do that, what I call inversion of the risk analysis than setting some arbitrary numerical standard to achieving greater safety in new reactors.

DR. KRESS: I would like to comment that there's one area of the DPO that I agreed with.

The question of surrogates. Originally they arose as the LERF being a surrogate for the pump fatality safety-goal, the quantitative health and safety -- and the CDF then came along as being somewhat of a surrogate for the latent.

We need to get away from those things as surrogates because they are not good surrogates. They served a purpose for awhile because you don't have the capability to always do a good level

three. And you can use those as some sort of an estimate of what a level three might look like if you want to use level three results.

In our letter, I think we suggested that CDF and LERF or LRF – you take your choice -- ought to stand alone by themselves. They should not be surrogates. We need to get away from thinking of them as surrogates at all, because they won't be and they are not very good.

And that in order to do the real risk, you really need a good level three. And I agree with Dr. Powers that that's difficult to do.

But you keep in mind there's two ends to this. You have an assessment of what the risk is and you have an acceptance criteria. You can adjust both of those.

And I think it's not always necessary, for example, to include things like model uncertainty.

You can adjust your acceptance criteria so that you have implicitly accounted for some of that.

So we need to think of both ends of those.

I think the acceptance criteria we have -- and I would call those the QHOs – I see are such a level that it's not that important to be completely rigorous in your PRA and not that important to include all the uncertainties. It is not that important to be complete full scope.

Now, that's just a personal opinion.

DR. WALLIS: Can I give a simple and not technical argument? CDF really is a measure of the reluctance of the Commission to allow another TMI-like accident. And LERF, without the "E" or with it, is really a measure of the reluctance of the Commission to allow another Chernobyl-like accident, which released a lot of radioactivity.

That is understandable to the public.

CHAIRMAN DIAZ: Thank you. Let me go to a subject that I really believe in certain ways I have been trying to keep almost on the back burner until we get to a better time.

But it is the issue of human reliability. It's something that I personally felt at one time that we have so many issues that were, what I call hard issues that we needed to address that it was not critical at the time to really begin a major effort on human reliability analysis results, improvements.

It might very well be that we are getting to the time where we do have some additional information that would allow us to work in that area, and I wonder if the members of the Committee have any comments on this?

DR. APOSTOLAKIS: It so happens that we are reviewing -- the subcommittee of ACRS will be reviewing or will start the review of human reliability models next week.

We will see where we are and we will advise the Commission whether we can undertake such a major effort.

But there are some things that are puzzling. I'm not speaking on behalf of the Committee.

We have been spending so much effort on developing Athena. And then what do you know?

Idaho develops what they call SPAR H for use in the real regulatory tools, in the SPAR models and so on.

So that's one of the things we are going to review next week.

Why? Why aren't we using Athena. Why was there a need for SPAR H?

But I must also say that in other places, you see things like the time that was mentioned earlier, you know, in the power uprate, the available time for the operators had changed a little bit. We don't know.

If it goes down from 31 minutes to 29, that's a little bit. If it goes down from 8 to 4, that's not a little bit.

But yet decisions are being made without demanding some technical basis for what we are accepting. That the probability will change a little bit. How do we know that?

Again, 31 minutes to 29, I'm willing to grant that the

probability of failure will not change much. But from 8 to 4 or 5. And then this other concept, for example, that the longer time you have, the better off you are because you will understand the problem.

Well, I saw the results of an experiment that said that if you can't figure out what's going on within 60 to 70 minutes, then it will take you a very long time to figure out what's going on.

CHAIRMAN DIAZ: You have figured out and then you have time to respond, then there is a significant difference?

DR. APOSTOLAKIS: Yes. So I think it is an area where we really have to come back.

Now, I'm beginning to have doubts that eventually we will have one model that everybody will accept. But we will have to wait for that.

CHAIRMAN DIAZ: The issue is many, many years ago we really did not have the data that was applicable to the reactor.

DR. APOSTOLAKIS: Yes, very true.

CHAIRMAN DIAZ: Now we have more, including the fact that our own programs, our reactor oversight programs, have actually been obtaining data that is not being used for this purpose.

And it might very well be that there might be a time in which we need to further use the models to give us that reduction that I think would be valuable.

COMMISSIONER LYONS: If I could just add, I had the opportunity to visit the Halden program about a month ago. Speaking as a non-expert, I was incredibly impressed with the quality of the work being done on human reliability in reactor settings there.

I hope that's considered by the Committee.

DR. APOSTOLAKIS: Yes, we are aware of it.

I think there is a lot of good work on what the operators will do under certain conditions and so on.

The hardest part is to, when you go to the probabilities and what is important there. And there are different models out there.

I think one additional element here in addition to the data that the Chairman mentioned is that there is a wider community now that understands the issues much better than, say, five years ago. And that is very important.

And much to everyone's surprise, they started reading each other's papers.

CHAIRMAN DIAZ: That's important. That's important.

Let me close my part with a question here for Dr. Denning.

You were talking about containment over pressure and the fact that the Committee made the statement that the licensee should demonstrate there are no practical alternatives that can

eliminate the need for such credit.

I like the word "practical alternatives."

Did the Committee identified in any one of the cases a practical alternative?

DR. DENNING: You know, I don't think they really have. And we haven't focused on it. I think the focus now is a little bit more towards looking at realistically -- is there realistically a need or not? Is there realistically going to be that potential for cavitation.

We certainly looked at -- we have asked the applicants for things like, well, what's the cost of replacement of pumps that would be able to work under these environments without any potential for cavitation. And we get mixed answers.

And there certainly is no interest on the part of the industry to go that way, because there is a strong feeling that it's all an artifact of the analysis as opposed to a real issue.

CHAIRMAN DIAZ: What do you think? Is it possible to be an artifact of the analysis? Or are you convinced the analysis is --

DR. DENNING: No, it's a personal opinion. I think that for the particular scenarios I have been looking at -- and we have to be careful not to generalize, I think it is an artifact of the analysis.

Since it is a defense-in-depth question, I think that the kinds of probabilities and levels of competence we need are not the

same as if it were a real issue.

CHAIRMAN DIAZ: Thank you very much.

Commissioner McGaffigan.

COMMISSIONER MC GAFFIGAN: Thank you, Mr. Chairman. I'm going to follow up on Commissioner Lyons' and Dr. Powers' conversation.

We have a paper before us at the moment on Part 52 that does two things in PRA space. You did not look at that paper.

But even as a PRA quality zealot, which the Chairman and Commissioner Merrifield probably think of me as, I will admit that what's proposed in the proposed rule in the way of what people would have to submit in the summer of 2007 is an impossibility.

The Chairman may want to note down that time.

But the thing, the other thing that the paper does is it passes on making a requirement that there be a living PRA going forward once the plant is operating. It just says we are not going to do that yet.

And I would just be interested in whether -- and I will phrase this in the most forceful way I can -- whether the Advisory Committee on Reactor Safeguards believes that plants that might start operating in 2015, probably operate until 2075, might operate longer, should have a living PRA during their period of operation as good as

you can make it or whether 100 years after WASH-1400 we should have plants operating, some future Commission, without high-quality PRA's?

COMMISSIONER MERRIFIELD: As I frequently do, just to interject, I would assume that unless the Committee as a whole has actually discussed that specific question, you would have to answer in your own particular view not on behalf of the Committee.

COMMISSIONER MC GAFFIGAN: These are a bunch of rationalists on the other side of the table. I wonder if they want to have that tool available to ACRSs and Commissions in the 2015 to 2075, 2095 time frame.

DR. APOSTOLAKIS: Yes.

COMMISSIONER MC GAFFIGAN: Okay. That's what I thought the answer might be. Thank you very much.

(Laughter)

DR. POWERS: As the resident structuralist –

COMMISSIONER MC GAFFIGAN: Even you would want it.

DR. POWERS: -- I would say I would not require that. I would make it so attractive for licensee and the management in control of his facility to have a living PRA that it would not be required.

DR. WALLIS: Can I jump in on this one?

COMMISSIONER MC GAFFIGAN: I still have my time.

As a structuralist on this side of the table, it still strikes me that we have not found that set of conditions for the current generation of reactors.

There is some possibility that we won't find it for the next set of reactors. And so I want belt and suspenders on whether we are going to have high-quality living PRAs.

DR. WALLIS: Can I jump into this one? Being neither a structuralist nor a rationalist, but being something I hope of a secular pragmatist who says what is the sensible thing to do, I would say that until I see something better as a measure of risk which you can inform the public about, we have to stick with the living PRA.

Maybe there is something better, but I don't know what it is. The best thing I can say.

DR. APOSTOLAKIS: In the regional paper, Commissioner, we never said we should be rationalists. The last section was a pragmatic approach, which is a combination of the two.

COMMISSIONER MC GAFFIGAN: Okay. Secular pragmatist. As long as we don't get to intelligent design, we are okay.

(Laughter)

COMMISSIONER MERRIFIELD: Let me interject for a second.

We all have our certain dogmas. And I have mine too. That is we try to speak in plain English in front of our audience as we are web streaming this.

It's been very interesting. I have learned a little bit about structuralism versus rationalism, which I didn't know as much about before the meeting today.

CHAIRMAN DIAZ: I don't know that I have learned that much of that.

COMMISSIONER MERRIFIELD: Well, I have been enlightened more about it today, that doesn't necessarily translate as well to the folks who we are trying to serve.

I just want to -- and this is sort of an entertaining discussion.

The bottom line of this all is we have got to come to, in my view, the bottom line of making the right health and safety decisions. And having this debate about which camp you are in --

COMMISSIONER MC GAFFIGAN: I have gotten a structuralist pragmatist, a structuralist and rationalist all to say that they think that having a living PRA for the next generation of reactors, whether you do it by rule or by inducement, is a good thing.

DR. WALLIS: Let's address Commissioner Merrifield's point. If the audience is the public, I think you have to give them some

measure of risk. You have to give them something, and you have to have it in a way which they can understand.

You can't just say it's the regulations. I think there needs to be something.

If it isn't PRA-based, what's it going to be based on?

DR. KRESS: Let me give another opinion as an ambidextrous schizophrenic, which means I don't know whether I'm a structuralist or a rationalist.

I can see a time, of course for the existing plants, the PWRs and BWRs, and for their extended life, you do need this risk for lots of reasons.

But I can envision a time with the new plants where their level of safety as measured by CDF and conditional containment failure probability is so good, you probably don't need a living PRA.

COMMISSIONER MERRIFIELD: This may be worth some more debate on their part.

COMMISSIONER MC GAFFIGAN: It may be worth a letter from you to Luis that answers the question as a group with appropriate dissent.

CHAIRMAN DIAZ: Very good.

Well, I think it's a very good discussion.

I think I should say that the it is rumored that

Commissioner McGaffigan asked the question in a time frame of 2015 to 2075, because 2075 is the last term he plans to be here.

(Laughter)

COMMISSIONER MC GAFFIGAN: There's longevity in my family but not quite that long.

CHAIRMAN DIAZ: Anyhow, on behalf of the Commission, I appreciate the efforts that the Committee has put into bringing to us issues that are of importance to the Commission.

You heard the Commission's concern on the issue of prioritization of your work, the importance that that has for Commission deliberations. Because, you know, this body informs the Commission, and the Commission uses the information from this technical body to deliberate and to make better decisions.

So we look forward to your work in prioritizing and going ahead at a time in which we all realize there are going to be great demands on the staff, on you and on the Commission.

And unless my fellow Commissioners have any other comments, we are adjourned.

(Whereupon, at 3:13 p.m., the hearing was adjourned.)