

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 1:00 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

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

4 With that, I look forward to your presentation.

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

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

11 Okay.

12 DR. WALLIS: Thank you, Commissioner.

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

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

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

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

1 then.

2 On the first slide -- there is a slide show that will appear.

3 At least you have it in front of you. It says that we have written 25
4 reports since we last met with you. I will mention a few of the topics.

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

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

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

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

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

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

21 DR. WALLIS: On the first slide of our accomplishments,
22 you will see there is a topic, "Risk-informed alternatives to the single

1 failure criterion." The staff made a presentation to us. They suggested
2 various alternatives. And we agreed with them that these were
3 interesting, but it was premature to make a choice before stakeholder
4 input had been received.

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

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

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

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

15 DR. WALLIS: Thank you.

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

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

1 work was needed before this revision was issued.

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

4 Next slide.

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

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

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

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

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

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

22 You have before you a list of our future activities. Many

1 of these are continuations of past and present activities. I will pick one
2 or two from each one of the slides and say a few words about them.

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

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

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

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

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

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

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

1 DR. WALLIS: We expect that it will happen, I would think,
2 within a few months. But I don't think it's immediate. It's not
3 immediate.

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

6 DR. WALLIS: February or March.

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

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

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

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

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

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

1 COMMISSIONER MERRIFIELD: I would argue there are
2 probably better uses of your time. My only reason for raising that is I
3 think you need to be -- the Commission hasn't necessarily endorsed
4 that, in other words. We are asking the staff to consider it.

5 DR. WALLIS: That's fine.

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

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

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

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

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

22 COMMISSIONER MC GAFFIGAN: We will get back to

1 that. I will come back to that in my questions.

2 DR. WALLIS: We will come back to that.

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

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

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

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

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

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

21 Almost from the day that was written it became a problem
22 because clads evolve. The alloy used for coating uranium dioxide fuel

1 we now have people moving in especially toward niobium alloys and
2 zirconium fuel.

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

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

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

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

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

22 Zirconium is unusual among metal alloys in that it can

1 absorb both oxygen and hydrogen. And upon cooling those alloy
2 elements make it brittle.

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

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

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

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

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

1 The criteria they have developed are fairly clever and well
2 researched. They do result in having an alloy independent process for
3 assessing cladding, but there's still very much technology specific
4 regulations.

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

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

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

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

20 COMMISSIONER MC GAFFIGAN: I think this is a
21 clarifying question. Is this in – updating regulatory requirements, the
22 50.46 rule that is currently up for comment, is this in there?

1 DR. POWERS: No, it is not.

2 COMMISSIONER MC GAFFIGAN: It's not.

3 DR. WALLIS: The next speaker is Tom Kress.

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

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

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

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

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

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

22 One is: In anticipation that there is a need for enhanced

1 safety for new plants as expressed by the Commission, just what is
2 meant by enhanced safety, and what level do you cast it at? That was
3 question one.

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

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

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

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

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

1 And the QHOs that the staff wants to use for the minimum
2 level safety are site risk parameters. And they involve things like
3 meteorology, population density, population centers, seismic; a number
4 of things like this that relate to how many plants are on the site. What
5 is their power level? What type of reactor is it?

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

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

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

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

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

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

1 sequences, how you deal with the uncertainties.

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

5 That's the design safety that I talked about.

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

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

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

21 Those are things that regulations are concerned about.
22 And there are things in our regulations that try to deal with societal

1 risks. Mainly it's the site suitability criteria.

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

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

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

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

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

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

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

1 Therefore, you apply the CDF and the LERF to each
2 module. And you don't want to hamper it with trying to figure out how
3 many you are going to have ahead of time.

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

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

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

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

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

22 And I think as it was pointed out today, we don't see this

1 that often from ACRS. There is typically a degree of unanimity among
2 their proposals. Some of the sausage-making that gets to unanimity,
3 we don't necessarily get to see or are a part of, but it does happen.

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

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

9 COMMISSIONER MERRIFIELD: But there were differing
10 views.

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

15 But where I sit on my end of the table.

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

1 termed perhaps the more irrational views.

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

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

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

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

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

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

22 I had very, very severe reservations about the idea that if

1 we chose to install a modern reactor on a site with older reactors that
2 we would then have to go through and upgrade the safety of those
3 existing reactors to meet some different standard than that they were
4 designed to. To strain analogies a bit, it would be something like telling
5 the airlines they could not introduce Boeing 777s until they upgraded
6 the safety of their 736s.

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

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

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

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

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

1 The QHOs require calculation of risk from all initiators and
2 all modes of operation. It requires means so it requires comprehensive
3 uncertainty analysis.

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

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

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

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

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

16 DR. SIEBER: Yes, I do.

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

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

22 COMMISSIONER MERRIFIELD: They try to be as much

1 of a collegial body as we do. I think we shouldn't quibble on that
2 particular --

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

5 COMMISSIONER MERRIFIELD: That comes through
6 loud and clear.

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

10 DR. POWERS: Thank you.

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

13 Is rationalist better than structuralist?

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

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

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

22 DR. POWERS: Good man.

1 COMMISSIONER MC GAFFIGAN: Okay. We will move
2 right along from there.

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

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

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

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

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

16 DR. WALLIS: George Apostolakis is the next speaker.

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

19 The National Fire Protection Association issued Standard
20 805 about four years ago that offered the choice of following a
21 deterministic approach to fire protection and probabilistic approach, the
22 rational approach.

1 The Commission issued a rule, 10 CFR 50.48©) in 2004,
2 which incorporated this standard by reference. Therefore, now the
3 licensees have this choice as an alternative to 50.48(b).

4 Of course, the standard does not give details as to how to
5 implement this approach, so the Nuclear Energy Institute issued Report
6 04-02 that supposedly offered implementation guidance. And the draft
7 Regulatory Guide endorsed this report with some exceptions.

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

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

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

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

1 You cannot be risk-informed without risk information.

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

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

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

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

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

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

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

1 The result is a very good piece of work. It offers structure
2 to the framework for doing a fire risk assessment that has the latest in
3 the state-of-the-art there. It also gives some specific guidance on
4 some items.

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

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

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

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

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

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

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

1 other Exelon.

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

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

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

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

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

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

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

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

21 MR. HYSLOP: No, no. We have demonstrated all the
22 individual procedures of this process. We are down there now doing

1 an integrated look, a scenario all the way to CDF.

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

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

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

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

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

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

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

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

22 And again, as I said earlier, one can question some of

1 these and disagree and so on.

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

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

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

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

11 COMMISSIONER JACZKO: Does the Committee have
12 eight positions?

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

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

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

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

1 The whole idea was to reduce the number of exemptions,
2 of course. I mean, if you have a rule and then you have 1,000
3 exemptions to it, that probably a hint that's not a very good rule.

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

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

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

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

22 In fact, we heard today that 25 units have decided to do a

1 fire PRA, 23, 25 units, which is a very good development.

2 Thank you, Mr. Chairman.

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

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

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

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

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

20 The first of the issues that I'm going to talk about is the
21 containment over pressure credit. In a loss-of-coolant accident for EPU
22 conditions, the quantity of decay heat that is transferred to the

1 suppression pool is higher than the amount that occurs under pre-
2 operate conditions.

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

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

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

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

22 The ACRS has maintained the position that credit should

1 only be authorized on a case-by-case basis. And we have used certain
2 criteria in our acceptance of various cases.

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

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

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

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

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

22 And those are the kinds of transient tests that they

1 propose and are certainly required.

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

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

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

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

11 The next issue involves PRA issues and EPU
12 applications.

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

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

19 A 20 percent uprate in power sufficient product inventory
20 is essentially 20 percent higher than it was in a pre-uprate condition.
21 Thus, even if the CDF and LERF are unchanged by the upgrade, the
22 risk of latent cancer fatalities is approximately 20 percent higher than in

1 the pre-uprate condition. And the risk from early fatality would be
2 increased by probably greater than 20 percent because of the
3 threshold nature of early fatality risks.

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

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

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

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

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

1 perform critical actions.

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

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

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

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

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

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

1 Obviously increased power implies increased steam flow.
2 It implies increased makeup water flow. And that also implies
3 increased velocities in some components.

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

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

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

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

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

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

1 resonant behavior there.

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

7 Now, that completed my presentation on the EPU issues.

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

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

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

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

19 CHAIRMAN DIAZ: Duly noted. Okay. All right.

20 With that introduction, Commissioner Merrifield.

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

1 I think I will start off with Dr. Wallis. I appreciate your
2 presentation of the overview of the many issues that you all are working
3 on.

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

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

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

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

19 Given the top 20 list that you have got, I do want to
20 have -- if you can give me a brief insight in terms of how we can
21 collaboratively work together to make sure you are focusing on the core
22 issues and perhaps how the Commission might help you in terms of

1 perhaps freeing up a little bit of time given the other work you are going
2 to be presented with.

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

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

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

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

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

1 well.

2 A very quick comment directed towards Dr. Apostolakis. I
3 appreciate the review of the fire protection efforts. We did have some
4 comments from the staff on NFPA-805.

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

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

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

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

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

1 DR. DENNING: We would be glad to do that. It could be
2 as late as Saturday that our deliberations are occurring. But there is
3 always a possibility that we will not be able to issue a letter during this
4 time.

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

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

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

11 COMMISSIONER MERRIFIELD: Get the cots out for
12 them.

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

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

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

21 There was a letter dated November 18th to the EDO
22 where you all agree with the staff recommendation to issue the generic

1 letter on grid reliability.

2 I guess my question, one of the issues that has been
3 raised in having reviewed that generic letter -- there are some very
4 interesting and penetrating questions that are included within it. But I
5 think there's one school of thought that there's a lack of understanding
6 of what we intend to do with it.

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

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

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

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

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

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

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

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

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

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

22 But in order to get the assurance that we comply with the

1 regulations that talk about off-site power sources, I think this work has
2 to be done.

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

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

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

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

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

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

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

22 I think that we have to wait until FERC -- at least three

1 months anyway from today, until FERC finally gets the fundamental
2 structure in place to do that and utilities realize what the independent
3 system operator, what function he will take, what tools they will have,
4 what the interfaces will be.

5 But I think that is an excellent idea.

6 COMMISSIONER MC GAFFIGAN: Could I clarify that
7 last remark?

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

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

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

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

21 And so, it depends on where you are in the country, how
22 well organized they are, how well the interconnection agency is

1 controlled, what tools they have and what degree of communication.

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

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

8 CHAIRMAN DIAZ: Thank you, Dr. Sieber.

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

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

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

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

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

1 I understand that in the past on this general subject, there
2 have been meetings where NRC and FERC have sat together to
3 discuss issues.

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

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

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

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

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

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

21 They have been working hard. They do have their ERO
22 Energy -- help me here -- Electricity Reliability Organization. It was

1 encompassed within the Energy Bill; that they are working on right now.

2 There may well be a time, and I think it may be useful for
3 the Chairman to have a discussion with folks over at FERC to see
4 whether perhaps you want to think about having another meeting
5 perhaps later in May or so to go over where we are and where they are
6 in these efforts to make sure that we have that energy security we all
7 seek.

8 CHAIRMAN DIAZ: Thank you. Commissioner Jaczko.

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

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

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

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

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

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

1 to resort to approximate models.

2 One approach, for example, is to use the so-called zone
3 models where you basically divide the room into two zones. And you
4 have the hot gas layer and then ambient temperature below.

5 Now, that is an approximation.

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

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

12 In the report, the joint EPRI, NRC report there is a cone of
13 35 degrees and so on.

14 These uncertainties in my mind are difficult to evaluate.

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

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

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

3 DR. APOSTOLAKIS: Yes.

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

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

8 The report does not say this is the way.

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

10 COMMISSIONER JACZKO: Surprised in what sense?

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

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

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

21 On the other hand -- if I may?

22 COMMISSIONER JACZKO: Sure.

1 DR. APOSTOLAKIS: From day one, 1981, when the Zion
2 PRA was issued, people have been saying that the uncertainties in the
3 external event analysis, fires and earthquakes, are so large compared
4 to the internal event analysis that you cannot put them together with
5 internal events.

6 I disagree with that.

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

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

11 COMMISSIONER MC GAFFIGAN: Mark that down on
12 2:19 p.m. on December 8th. My birthday.

13 (Laughter)

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

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

21 DR. APOSTOLAKIS: Two comments on that.

22 First of all, the regulatory decisions are supposed to be

1 risk-informed, of course.

2 COMMISSIONER JACZKO: That's risk information
3 comes from the fire modeling in the PRA.

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

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

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

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

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

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

19 COMMISSIONER MERRIFIELD: Again, no pun intended.

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

21 (Laughter)

22 COMMISSIONER JACZKO: If I could ask one more brief

1 question.

2 DR. APOSTOLAKIS: One very last thing. Earthquakes,
3 too. The uncertainties were huge. But they were huge on the low side.

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

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

10 So maybe saying large uncertainties is not the whole
11 story.

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

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

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

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

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

1 We hear that experiments have been done at Argonne
2 which begin to show this and that. But until it's put together, it's
3 premature to reach a conclusion.

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

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

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

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

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

20 CHAIRMAN DIAZ: Thank you so very much.

21 Commissioner Lyons.

22 COMMISSIONER LYONS: I certainly continue to greatly

1 appreciate the work that the Advisory Committee is doing. I appreciate
2 the incredible amount of hard work you are doing and the volume of
3 work you are doing on everything from ESPs to the research reports to
4 many of the other applications. So count me as a very large fan.

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

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

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

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

1 part of your review in, I guess it was fiscal 2004.

2 So it's both general and specific.

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

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

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

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

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

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

16 Am I being helpful or not here?

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

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

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

1 us and responded immediately.

2 COMMISSIONER MC GAFFIGAN: That's in the research
3 issue?

4 DR. POWERS: Yes.

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

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

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

14 DR. WALLIS: No.

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

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

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

1 I guess maybe you could just have my vote that this
2 ranked reasonably high in your prioritization as you look at subjects for
3 the next year.

4 DR. WALLIS: Thank you.

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

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

9 COMMISSIONER MC GAFFIGAN: It ranks high on mine.

10 CHAIRMAN DIAZ: I think we just voted.

11 (Laughter)

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

14 CHAIRMAN DIAZ: Go ahead.

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

19 Two particular questions.

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

1 meant by that?

2 And then I'm also curious in general if in your discussions
3 with the staff if you have formed an opinion as to whether as an agency
4 we are well prepared to deal with the challenges that are going to be
5 raised by digital INC, or if we need to be further strengthening that
6 area?

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

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

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

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

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

1 So what do you do then? I mean, if you follow the
2 traditional approach, then, of course, you treat the software like another
3 component. And you say, okay, so this pump has this failure rate and
4 digital pump has this other failure rate.

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

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

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

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

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

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

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

22 So we will see. It's a very difficult issue, by the way. I

1 don't think -- I mean, we are not just telling the staff, hey, guys, you
2 didn't know this and everybody else knows. Nobody knows how to do
3 it.

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

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

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

14 COMMISSIONER LYONS: We will be.

15 DR. APOSTOLAKIS: Yes, we will be.

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

18 CHAIRMAN DIAZ: Thank you so very much.

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

22 The fact is I remember when I was a very, very, very

1 young dean for research in California, and Professor Apostolakis was a
2 senior professor. And I always looked up to him.

3 (Laughter)

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

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

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

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

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

22 That's just one comment.

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

3 I do agree that it would be important how the Committee
4 plans the work for the upcoming new licensing framework and the
5 differences that we are now seeing in the, from what we thought was
6 going to be certain type of approaches, the approaches have changed.
7 Planning your work will certainly be very helpful to the Commission.

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

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

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

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

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

1 In my opinion, a better choice of a safety metric which
2 would include large early release would be a conditional containment
3 failure probability. You have to properly define that because some
4 containments are vented and some containments are confinements.

5 But properly defined that would be a better metric.

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

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

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

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

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

1 CHAIRMAN DIAZ: All right. I will certainly –

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

4 CHAIRMAN DIAZ: And I should look at the transcript.

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

7 COMMISSIONER MC GAFFIGAN: That's fine.

8 CHAIRMAN DIAZ: I understand.

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

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

20 I think I understand the mathematics of it. I like to
21 sometimes think that we need to put these things in a time domain to
22 again get a complete picture, because the picture is not complete

1 unless you look at what the mitigation capabilities are as time gets
2 longer and longer.

3 And I do believe that in this country, we will not let a
4 containment failure have a significant amount of time. There are many
5 things that we can do about it.

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

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

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

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

14 DR. KRESS: I think it really is 23.

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

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

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

3 COMMISSIONER MERRIFIELD: Mr. Chairman, are we
4 ever in comfort zone?

5 CHAIRMAN DIAZ: I remember one time.

6 (Laughter)

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

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

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

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

21 Dr. Denning will make the point to you that if we move to
22 the non-nuclear, world much more sophisticated types of analytic tools

1 are used for things like fire propagation. And certainly we could adopt
2 those.

3 But we are going to have additional problems when we go
4 to saying, gee, how does equipment respond to these fire insults? And
5 when we look there, we find we have relatively incomplete experimental
6 data, relatively incomplete analytical capabilities to understand how
7 equipment responds to a fire insult.

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

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

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

20 CHAIRMAN DIAZ: Okay. Commissioner McGaffigan.

21 COMMISSIONER MC GAFFIGAN: Thank you, Mr.
22 Chairman.

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

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

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

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

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

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

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

13 (Laughter)

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

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

1 the wrong answer from the PRA.

2 But whatever. And that has happened. I mean, that has
3 happened in the history of the Commission, recent history of the
4 Commission, colorizing the Davis-Besse event took the staff an
5 enormous amount of time. Anybody who was a structuralist knew it
6 was red from the first moment. But the rationalists worked their models
7 and worked their models and worked their models, and they eventually
8 got to red.

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

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

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

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

1 engineering solutions.

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

3 The other area that I think is terribly, terribly important,
4 and I urge to you do some strategic thinking about and talk to the staff
5 about it and talk to the Commission is the new plants. Commissioner
6 Merrifield said that.

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

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

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

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

22 It is a complicated document. And the industry would like

1 us to have it yesterday.

2 We have the 73.55 security rulemaking that is absolutely
3 vital, that we are supposed to get in the spring. And it is a proposed
4 rule -- in May, I guess that's still spring.

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

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

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

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

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

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

1 If the staff is asking you to do something which you know
2 on its face is marginal, I think you have to come to us and say -- or go
3 to the EDO first -- and say we don't think this rates. In the scheme of
4 things, this just isn't worthy of our time. If it were a slow period, sure we
5 could have done it. But not now.

6 CHAIRMAN DIAZ: Thank you, Commissioner
7 McGaffigan.

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

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

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

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

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

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

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

3 COMMISSIONER MERRIFIELD: I didn't frame my
4 question very well.

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

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

9 COMMISSIONER MERRIFIELD: Okay.

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

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

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

16 COMMISSIONER MERRIFIELD: Thank you, Mr.
17 Chairman.

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

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

22 Dr. Wallis, you mentioned that you are waiting to hear

1 some things from the staff before you can formulate an opinion. Right
2 now everything is just kind of a gelatinous blob in some ways, looking
3 for somebody to put some molds in there to get something solid out. I
4 guess there is no pun intended there either. Chemical effects.

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

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

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

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

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

21 DR. WALLIS: I think also we have been doing nothing
22 but have been thinking about the problem. But we haven't reached the

1 point where we can say there's any conclusion from it.

2 CHAIRMAN DIAZ: Commissioner Lyons.

3 COMMISSIONER LYONS: Question for Dr. Powers, I
4 think.

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

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

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

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

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

21 And I think the next step to go beyond that and start
22 looking at things like fire PRA, at shutdown PRAs, quantify external

1 events of seismic nature and things like that is a slow step right now.

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

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

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

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

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

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

1 We need to get away from those things as surrogates
2 because they are not good surrogates. They served a purpose for
3 awhile because you don't have the capability to always do a good level
4 three. And you can use those as some sort of an estimate of what a
5 level three might look like if you want to use level three results.

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

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

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

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

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

20 So we need to think of both ends of those.

21 I think the acceptance criteria we have -- and I would call
22 those the QHOs – I see are such a level that it's not that important to

1 be completely rigorous in your PRA and not that important to include all
2 the uncertainties. It is not that important to be complete full scope.

3 Now, that's just a personal opinion.

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

10 That is understandable to the public.

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

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

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

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

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

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

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

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

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

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

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

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

22 But yet decisions are being made without demanding

1 some technical basis for what we are accepting. That the probability
2 will change a little bit. How do we know that?

3 Again, 31 minutes to 29, I'm willing to grant that the
4 probability of failure will not change much. But from 8 to 4 or 5. And
5 then this other concept, for example, that the longer time you have, the
6 better off you are because you will understand the problem.

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

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

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

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

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

19 DR. APOSTOLAKIS: Yes, very true.

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

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

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

8 I hope that's considered by the Committee.

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

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

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

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

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

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

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

1 You were talking about containment over pressure and
2 the fact that the Committee made the statement that the licensee
3 should demonstrate there are no practical alternatives that can
4 eliminate the need for such credit.

5 I like the word "practical alternatives."

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

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

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

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

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

21 DR. DENNING: No, it's a personal opinion. I think that
22 for the particular scenarios I have been looking at -- and we have to be

1 careful not to generalize, I think it is an artifact of the analysis.

2 Since it is a defense-in-depth question, I think that the
3 kinds of probabilities and levels of competence we need are not the
4 same as if it were a real issue.

5 CHAIRMAN DIAZ: Thank you very much.

6 Commissioner McGaffigan.

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

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

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

16 The Chairman may want to note down that time.

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

21 And I would just be interested in whether -- and I will
22 phrase this in the most forceful way I can -- whether the Advisory

1 Committee on Reactor Safeguards believes that plants that might start
2 operating in 2015, probably operate until 2075, might operate longer,
3 should have a living PRA during their period of operation as good as
4 you can make it or whether 100 years after WASH-1400 we should
5 have plants operating, some future Commission, without high-quality
6 PRA's?

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

11 COMMISSIONER MC GAFFIGAN: These are a bunch of
12 rationalists on the other side of the table. I wonder if they want to have
13 that tool available to ACRSs and Commissions in the 2015 to 2075,
14 2095 time frame.

15 DR. APOSTOLAKIS: Yes.

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

18 (Laughter)

19 DR. POWERS: As the resident structuralist –

20 COMMISSIONER MC GAFFIGAN: Even you would want
21 it.

22 DR. POWERS: -- I would say I would not require that. I

1 would make it so attractive for licensee and the management in control
2 of his facility to have a living PRA that it would not be required.

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

4 COMMISSIONER MC GAFFIGAN: I still have my time.

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

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

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

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

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

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

1 (Laughter)

2 COMMISSIONER MERRIFIELD: Let me interject for a
3 second.

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

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

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

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

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

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

20 COMMISSIONER MC GAFFIGAN: I have gotten a
21 structuralist pragmatist, a structuralist and rationalist all to say that they
22 think that having a living PRA for the next generation of reactors,

1 whether you do it by rule or by inducement, is a good thing.

2 DR. WALLIS: Let's address Commissioner Merrifield's
3 point. If the audience is the public, I think you have to give them some
4 measure of risk. You have to give them something, and you have to
5 have it in a way which they can understand.

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

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

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

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

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

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

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

1 CHAIRMAN DIAZ: Very good.

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

3 I think I should say that the it is rumored that
4 Commissioner McGaffigan asked the question in a time frame of 2015
5 to 2075, because 2075 is the last term he plans to be here.

6 (Laughter)

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

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

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

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

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

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