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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

MEETING OF THE SUBCOMMITTEE ON FUTURE PLANT DESIGNS

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WEDNESDAY,

MARCH 7, 2007

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The meeting was convened in Room T-2B3 of Two White Flint North, 11545 Rockville Pike, Rockville, Maryland, at 10:00 a.m., Dr. Thomas Kress, Chairman, presiding.

MEMBERS PRESENT:

THOMAS KRESS Chair

WILLIAM SHACK

MARIO BONACA

DANA POWERS

MARIO BONACA

SAID ABDEL-KHALIK

GRAHAM WALLIS

OTTO L. MAYNARD

MICHAEL CORRADINI

GEORGE APOSTOLAKIS

NRC STAFF PRESENT:

DAVID FISCHER	Designated Federal Official
MARY DROUIN	Office of Research
MARTIN STUTZKE	NRR
JOHN MONNINGER	NRR/Brookhaven Labs
VINOD MUBAYI	
STU RUBIN	

ALSO PRESENT:

JOHN LEHNER	
TOM KING	ISL
BRUCE MRORCA	
BIFF BRADLEY	
ED BURNS	

A-G-E-N-D-A

P-R-O-C-E-E-D-I-N-G-S

9:43 a.m.

CHAIRMAN KRESS: This is a meeting of the Advisory Committee on Reactor Safeguard, Subcommittee on Future Plant Designs.

I am Tom Kress, Chairman of this Subcommittee.

Members in attendance are supposed to be some of these, they're not all here yet, Dr. Said Abdel-Khalik, George Apostolakis is supposed to be on his way. I don't know where Sanjoy Banerjee is. Mario Bonaca. Mike Corradini is supposed to be here. I don't know if the weather's got them or not. Mr. Otto Maynard, Dana Powers, Bill Shack and Graham Wallis.

The purpose of the meeting is to review the staff's work on the technology-neutral licensing framework, which is in working draft NUREG-1860. And the focus is on ensuring the value of such an approach versus the development of a licensing framework for specific design, such as a high temperature gas cooled reactor or a liquid metal cooled reactor.

During the briefing the Committee will also explore with the staff the pros and cons of developing a licensing framework for specific designs.

The Subcommittee will hear presentations by and hold discussions with the staff and other interested persons regarding this matter.

The Subcommittee's job is to gather information, analyze the relevant issues and facts and formulate proposed positions and actions as appropriate for deliberation by the full Committee.

Dr. David Fischer is the Designated Federal Official for this meeting.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the *Federal Register* on September 25, 2006.

A transcript of the meeting is being kept and will be made available as stated in the *Federal Register* notice.

It is requested that speakers and others identify themselves. Come to a microphone first and speak with sufficient clarity and volume so that they can be readily heard. That really means come to a microphone.

We have received no written comments or requests for time to make oral statements from any members of the public.

I would encourage those present to feel

free to offer comments on specific items as we proceed through the agenda. This is going to be somewhat of a freewheeling meeting. It's an interchange rather than as opposed to mostly formal presentations.

Also, I intend to try my best to enforce our agreement to allow the speakers the first ten minutes without interruption. Now, I implore the Committee to help me with that, because that would be very helpful. In the first ten minutes there is going to be an overview.

MEMBER WALLIS: It must depend on what they say.

CHAIRMAN KRESS: It's going to be an overview.

MEMBER WALLIS: The first ten minutes is introduction. If the first ten minutes is overview and introduction, that's fine.

CHAIRMAN KRESS: That's right.

MEMBER WALLIS: But if there's a technical matter raised --

CHAIRMAN KRESS: No, I think it's an overview.

MEMBER WALLIS: Okay.

CHAIRMAN KRESS: And then we'll get into the same technical issues after that ten minutes.

But with that, I'll call upon Mary Drouin, I guess, to introduce the staff and the subject matter.

MS. DROUIN: Good morning. We're delighted to be here. I'm Mary Drouin with the Office of Research.

Sitting at the table with me is Marty Stutzke from -- I'm not sure where he said where he's from, kind of in the middle.

MR. STUTZKE: NRR and then later to NRO in April.

MS. DROUIN: Also at the table is John Monninger from Brookhaven National Labs and Tom King from ISL.

Before we get started, I want to turn it over to John Monninger.

MR. MONNINGER: Good morning, Mr. Chairman and fellow ACRS Members. My name is John Monninger. I'm the Deputy Director for Probabilistic Risk and Applications from NRC's Office of Nuclear Regulatory Research.

First of all, I'd like to thank you very much for the opportunity to come down and discuss this important project with you. As, you know, we appreciate the interest from the ACRS. And, as you

are well aware, the Commission is also interested in the future of this project.

We've been at it for the past three years. It's been an agency effort. We've had, you know, had interactions with NRR, the Office of Nuclear Reactor Regulation and support from NRO also.

We've had several significant workshops and meetings with stakeholders out there to try to guide the development and insights into this project.

As you're aware, we issued it for public comment as part of a advanced notice of proposed rulemaking last year. It would be a new potential rulemaking for a new Part 53. In support of that we held additional meetings with stakeholders.

I think one thing that's important, as you'll see through this discussion, is though the project has been ongoing for the past three years there's been some recent developments that play into this project also. In particular, I guess, you know the passage of the Energy Policy Act and the need for the NRC and DOE to work collectively together in the development of a licensing strategy for the next generation nuclear power plants.

So, you know, the past year so we've been cognizant of these other initiatives out there and

ongoing and we're trying to balance what we have learned from this effort, the technology-neutral framework, into the agency's future efforts for the NCNP projects.

So with that, I'll turn it back over to Mary Drouin. Or also, I should introduce Eileen McKenna. Her organization, NRR/NRO, they actually have the lead for the ANPR, the Part 53 efforts.

MS. DROUIN: Okay. We're here today to have a technical exchange on the framework document, particularly all the technical issues. There are a lot of technical issues in this document, somewhat complex. And we've got the whole day to go through and it'll take us all day if not, you know, more.

But I want to go through briefly some introductory remarks, give you an overview of the framework that's not technical. It's an overview of what this framework is conceptually. And we did ask that we could do that uninterrupted. And then get into the technical discussion in a round table format.

We haven't prepared a lot of viewgraphs for the round table because it's meant to be informal and we didn't want to come in with a formal presentation. We have some key viewgraphs, you know, for each of the technical topics. We've got a copy of

the framework document here. Hopefully, all the Members also have a copy.

I think John touched on a lot of this. You know we started back in January 2003. The Advanced Reactor Research Plan recognized the need for a new licensing framework for future reactors. And the program was initiated back then. You know the need for it was because our current regulatory structure has been very focused on light water reactor technology. And so when you start thinking about some of these unique aspects of these advance reactors that it begs the questions how applicable or how burdensome is it would it be to use the current Part 50. And then also when you start looking towards implementing the PRA policy statement and trying to bring risk in an integral manner as an integral part then with this in the midst of risk-informing Part 50 there's --

MEMBER WALLIS: Am I allowed to ask a question, Mr. Chairman? It's to clarify this here.

CHAIRMAN KRESS: Okay. I will allow that.

MEMBER WALLIS: Okay. What do you mean by a PRA? What's the --

MS. DROUIN: A probabalistic risk assessment.

MEMBER WALLIS: No, no. What's the output

from the PRA? Is it CDF or is it a more comprehensive assessment of the effects on the public?

MS. DROUIN: When I use the word PRA, I am using it in its entirety here.

MEMBER WALLIS: So it doesn't necessarily mean that CDF is the output?

MS. DROUIN: That's right.

MEMBER WALLIS: Okay. That's good. Thank you.

MS. DROUIN: That's right, yes.

Okay. Just real quick on the status. You know, all the initial work in terms of what we've planned to do in this framework document has been completed and we're in the midst of publishing it. It's going to be NUREG-1860 to be published in the early summer. We're looking at the June time frame.

We're going to get more into this the next bullet as we get into the technical discussion, but I wanted to bring it up right away: Is that we have coined new phrase "risk-derived." And it's very important to this document versus using the term "risk-informed." And we'll get more into that.

And another major aspect of the framework is that we really did try to integrate looking at the severe accident, the instant reactors, the PRA and the

safety goal policy statements and all the expectations that were outlined in these policy statements by the Commission we have tried to be very faithful in integrating. And that provided some challenges to us.

The ANPR which attached the framework to it -- not attached but referenced it, there were seven topics in that ANPR. Out of those seven topics five of them were related to the framework. And I think there were some 70 odd questions in the ANPR. And out of those 70, I think a good 60 of them were related directly to the framework.

Listed there are the stakeholders that we received comments from. And in some cases you can see some of the commentors sent in two sets of comments. Because the ANPR was issued in May, it didn't close until December. When we issued it in May we put on the website the latest version of the framework document. And we put a newer version, a completed version in July. So that was a lot of the reason why you see two sets of comments. And also, just because it was very complex. So we received some sets in September and then more detailed comments in December.

What I'm going to go over just very quickly is not any of the technical comments yet that we received. We'll get into that. But I want to give

you an overall at a high level in terms of where we should be moving forward. In terms of the overall view whether this should be technology-neutral versus technology-specific. And whether and how we should move forward to rulemaking. Just really give you a very high level sense of that.

And then later on we do have comments for the technical input we received.

Whether or not we should go to the Part 53, here's some example comments. You know, we should move forward. They support the effort.

We had this one comment that we've departed too far from the deterministic approach. And the basis for that is because they feel like we have totally departed from addressing common cause failure. I'm not really sure where that comment came from because we haven't done that.

But overall the comments were generally supportive of trying to move forward.

Technology-neutral versus technology-specific? A mixture of views and they all came down to some supported the technology-neutral regulation with implementing guidance technology-specific, Some supported going directly to regulations that were technology-specific. And then some indicated it was

too premature to decide. So there was no consensus there across the stakeholder comments.

How we should proceed forward with regard to rulemaking. I think, you know, it was kind of a general consensus when you looked at the different ones that we should not to rulemaking right away. You know, gain some experience first. One suggestion was first do a design certification with a non-LWR used in the framework.

Another one, they talked about this multi-year phased approach to rulemaking. They didn't quite explain it, but I think it probably went in line with using the step approach was to develop first a draft rule, put it out for information, review and approve an on non-LWR design use in a 50.52 process, evaluate the draft rule against that and then publish the draft rule for comment. But the main point is that don't go to rulemaking right away in the near term.

So, our next step, as I said, we're going to publish 1860 in early 2007. We're looking towards the June time frame.

We are in the midst of preparing a second paper to respond to the Commission SRN to provide the staff recommendation on whether, and if so how to proceed with rulemaking. In the paper right now our

thinking is that all activities related to the framework to be terminated and evaluate the need to defer rulemaking until experience is gained with NGNP and GNEP.

We do plan to come in May to discuss more fully this paper.

MEMBER WALLIS: I guess we've passed ten minutes now, huh?

MS. DROUIN: I know.

MEMBER WALLIS: This comes as a NUREG. And yet there seems to me there are many ways in which one could do it other than the way that you've laid out in the framework. I think as a NUREG gives it a kind of authority. And I hope this won't snuff out attempts to do a different job which could be better.

CHAIRMAN KRESS: Yes, that's what concerns me about the bullet that says "All activities related to Framework to be terminated." Right. I think there are still some things to fine tune it, maybe, to explore other --

MS. DROUIN: Let's come back to that at the end, the end of the day. Because that's going to tell you exactly what we're going to be doing with this framework in addressing some of those.

CHAIRMAN KRESS: Yes, but you know, it

sounds to me like in this bullet that this what you're going to recommend to the Commission that all activities--

MS. DROUIN: That is what is being discussed by management.

CHAIRMAN KRESS: Yes. Well, I hope they don't do that. But I think there's sort of some work to be done and be useful.

Proceed, please.

MS. DROUIN: Okay. I'm going to try and go through these real quick also. I apologize I'm taking a little more than ten minutes. But that's because, John, we gave him some time. So his time really doesn't count.

CHAIRMAN KRESS: That's all right. You should have almost another five minutes.

MS. DROUIN: Thank you.

Okay. You know, probably a big lesson we've learned is time to really explain what this framework document is. And it's amazing all the different understandings of what this framework is. So just really try to explain what this framework is, what it is not.

It is not regulation. I am amazed at how many people think that this document is a set of

regulations. It is not. It's a framework. It's set of technical guidelines and criteria.

It could serve as the basis for rulemaking. It uses this risk-derived approach, and I am going to get into that. And it can be applied and implemented on either technology-neutral or technology-specific basis. I think we did ourselves a disservice from the very beginning calling it a technology-neutral framework, and we tried to remove those words from the title because it can be applied to either technology-neutral or technology-specific. We've approached it from a technology-neutral so that it could be applied to any reactor technology, and somehow we've miscommunicated that.

Risk-derived and risk-informed, I'm going to give you a little bit of a hint here. We're going to really get into this when we get into round table discussion of our probabilistic approach. But if I look at Part 50 right now, Part 50 you have a gross set of regulations that were based on deterministic criteria. It's a deterministic foundation. We are now coming in and using risk insights to modify it where we think it's appropriate. That's what we mean as a risk-informed approach. It started from a deterministic foundation.

What we've done in this framework is we've starting from a probabilistic foundation and we've come in and modified it and integrated deterministic and defense-in-depth criteria to deal with uncertainties. But we've started from a probabilistic foundation.

And these two things don't necessarily get you to the same place. Ideally they should, but I don't think they will because we're not coming in and risk-informing Part 50 in an integrated manner. We're picking things here and there. So I don't think ultimately they will get you to the same place. And I think that's --

MEMBER ABDEL-KHALIK: But that's sort of really part of my major concern in a sense that in the previous slide you say that "this can serve as the technical basis for rulemaking --

MS. DROUIN: Right.

MEMBER ABDEL-KHALIK: Right. So presumably a licensee who wishes to license a current generation reactor can use this approach --

MS. DROUIN: Yes, it could.

MEMBER ABDEL-KHALIK: -- instead of Part 50. And it is quite possible that by doing this they end up with less stringent criteria than the current

Part 50. At least in reading this there is no way I can assure myself that if a licensee were to follow this approach, they would end up at the same point that they would end had they used Part 50.

MS. DROUIN: Okay. I mean, I don't want to get into a detail on that. But just a quick answer. I disagree with your word "stringent." I think they will end up at a safer place. They may not the same requirements, but I think they will end up at a safer place than the current set. That's my personal thing.

MEMBER ABDEL-KHALIK: Well, my concern --

MS. DROUIN: So "stringent" to me is not, I don't think, the correct word.

MEMBER ABDEL-KHALIK: But my concern is that this may serve as sort of a way to get around some of the requirements in Part 50. For example, using the double-ended guillotine break as a design basis accident. Would this be a way for a licensee to get around that requirement and use, you know, a smaller size break like Part 50.46?

MS. DROUIN: How the requirement would turn out in terms of a comparable §50.46, I couldn't tell you at this point.

MEMBER ABDEL-KHALIK: But if that is the case, then it would be a less stringent requirement?

MS. DROUIN: No. No. Not at the overall risk. I don't agree with that. I truly don't.

MR. KING: I think it could possibly be a better requirement.

MS. DROUIN: That's what I'm saying.

MR. KING: Because it's not going to require diesel generators to start as fast, valves to close as fast. It will make them more reliable.

So you got to look at both sides of this.

MEMBER ABDEL-KHALIK: Well, at the end of the day it has to be really demonstrated to me that the point I was trying to make is that going through this route or the old route, you're not going to necessarily end at the same point.

MS. DROUIN: Yes.

MEMBER ABDEL-KHALIK: And the point is where we end up has to be demonstrated to be safer than --

MEMBER WALLIS: Well, Said, what's your criterion for being safer?

MEMBER ABDEL-KHALIK: Overall risk to the public.

MEMBER WALLIS: Okay. So that's their basis. And if they can show that there's less risk with their approach than Part 50, then good for them.

CHAIRMAN KRESS: I think in order to arrive there, you have to have the technical functional equivalent of a CDF and a LERF that's technology-neutral as an overall assessment of the status of the design. And that's the one little part that I saw was missing from the framework.

MS. DROUIN: Right.

CHAIRMAN KRESS: But we'll get into that.

MS. DROUIN: That's going to be our very first technical issue when we get to the foundation.

CHAIRMAN KRESS: Wonderful. Wonderful. But in my mind that would ensure you end up at a better state.

MS. DROUIN: Right.

CHAIRMAN KRESS: Or at least the equivalent state.

MS. DROUIN: Because I do think that this approach takes you to a safer state.

CHAIRMAN KRESS: Yes, I think it does.

MS. DROUIN: Okay. I think I've kind of said. You know, you got the framework which is the guidelines criteria. You implement the framework to get you to your regulations and regulatory guidance.

I'm not going to go through these because we're not meant to quibble on any of these words. All

this is meant to show you here because people have had this "well, what does mean when you actually start writing some regulations based on this?" So all I've tried to do here is show you an example of the scope and level of detail of what we're talking about.

And what you have here in the right hand column is, for example, where it says FW framework. This would be a new regulation. You don't see this regulation anywhere in the current Part 50. It's a framework. It only needs to be written at a technology-neutral level.

CHAIRMAN KRESS: A question, Mary. If one wanted to go from the framework to regulation, do you have an idea how long that would take? Is it two years like normal regulation or three?

MS. DROUIN: We had actually looked at laying out a schedule. And I think it comes down to not so much writing the regulations, but the developing regulatory guidance that would have to go with it and how much of that you would need to write.

CHAIRMAN KRESS: So to go to full blow regulation here would take quite a while? A lot of effort?

MS. DROUIN: I don't think it's a ten year effort.

CHAIRMAN KRESS: Five?

MS. DROUIN: I think you could do it in five years.

CHAIRMAN KRESS: Just, you know, that's all I wanted, was some sort of an idea.

MS. DROUIN: I think you could do it in five years.

CHAIRMAN KRESS: Because we're supposed to respond to this Commission.

MS. DROUIN: Yes.

CHAIRMAN KRESS: That's part of the element of my thinking is how long it's going to take to go.

MS. DROUIN: The next one is just to show that we're not abandoning good past thinking. So here's an example where it's the maintenance rule where we would take the language from the maintenance rule and then we would add stuff. So you can see that right here that we take §50.65 and then is what we would add based on the framework. And we think this can remain technology-neutral and it would be equally applicable to all technologies.

Here's the example of one where the rule could be written. It would come right out of the framework, not a comparable in Part 50. The rule

would be written at this technology-neutral level but would be implemented on a technology-specific basis. So you'd have to have implementing guidance for each reactor technology.

We put these two in because we think these are critical just to show there would be regulations for PRA which don't show up now. These are coming directly out of the framework. And, again, we don't think they would have to be written on a technology-specific level, technology-neutral we think would be adequate.

So you can look at these at your leisure. But these are not hard and fast words. This was just to give you an idea of what you would see if you implemented the framework.

MEMBER POWERS: What I don't understand, Mary, if we go to energetic reaction control--

MS. DROUIN: How do I go back?

MEMBER POWERS: That as written doesn't tell me what I'm supposed to achieve.

MS. DROUIN: That's right.

MEMBER POWERS: Whereas the corresponding regulation in 10 CFR Part 50 deals only with what I'm supposed to achieve. I mean, it's kind of interesting.

And §50.46 says thou shall not have more than one percent overall reaction of your clad and no more than 17 percent and the most reacted part of the core. And the whole purpose for saying that is to assure you have ductility in the cladding after functioning of the ECCS.

The trouble I see with this without telling me what I'm supposed to achieve is that I can say, okay, on Tuesday I don't turn on a water facet and that in some way prevents and mitigates -- anything will satisfy that requirement.

MS. DROUIN: That's why you see this slash here. Because here's how to write it. We don't think you could go much further -- you know,you maybe could. But I didn't want to get into -- you know, I knew I was going to pick one example, that was going to be a bad example.

MR. KING: Well, I think the answer to your question is what needs to be achieved is stated in a different requirement in terms of meeting the frequency consequence occur, meeting the QHOs. There's some deterministic requirements --

MS. DROUIN: Right.

MR. KING: on the on the license basis on this.

MEMBER POWERS: Then why have this rule here at all? If that's going to be what you're trying to achieve, then why have this rule?

MR. KING: Well, you can argue that. But I think this rule is to remind people that this is an important area, sodium water reaction, fuel coolant interaction. And it's sort of a deterministic rule and so you need to have some provisions in to deal with these types of accident. But I think your argument, you could argue that maybe you don't need this because you've got these higher level acceptance criteria.

MEMBER POWERS: Yes, but if you don't tell me where I'm trying to achieve, there's no point in having a rule. Because anything satisfies you.

MR. KING: Well, not anything. You still have to meet the frequency consequence curve and the QHOs --

MEMBER POWERS: In a separate requirement. This rule here, anything I do satisfies that. So it's nonfunctional.

MR. LEHNER: I think you have to a technology-specific for this rule, depending on the specific technology.

MEMBER POWERS: I think you just don't need it.

MR. LEHNER: Oh.

MR. KING: But you can't take them individually. This set of rules is a package.

MEMBER WALLIS: It's not as a rule and it's something you have to consider when you're looking at where things lies on the FC curve, isn't it? It's not a separate rule.

MEMBER POWERS: Yes. But why do I have to write something down --

MEMBER WALLIS: I don't think it is a separate rule.

MEMBER POWERS: -- here that's nonfunctional.

MEMBER WALLIS: I don't think you need a separate rule.

MEMBER POWERS: Well --

MS. DROUIN: I think Dave has got a point. We're not here to debate whether or not this particular rule should exist or not.

MEMBER POWERS: But it's enlightening on the philosophy with which we're developing this.

MS. DROUIN: Yes, it is. And from that perspective I think we need to take that into consideration.

MEMBER SHACK: But it's perhaps more

equivalent to a GDC than a rule.

MS. DROUIN: Well, GDC is a rule.

MEMBER SHACK: Well, in a sense that we think of §50.46 as a rule rather than the GDCs, which are much more general requirements.

MS. DROUIN: Right. I mean, unfortunately §50.46 to me is a unique rule in that it's so prescriptive and so specific.

MEMBER POWERS: Another way you can approach this thing is with a little effort I probably can come up for any given system with a 100,000 chemical reactions. A modest amount of effort. Some fraction of them will be exothermic. And I can question a licensee to death on "oh, what did you about this reaction? How about this reaction over here? What about this one here?"

MR. KING: Yes. I don't see anything necessarily wrong with that. You're just checking the completeness of their analysis.

MEMBER POWERS: It might take a while to get it done.

MR. KING: But you know the major ones, you know.

CHAIRMAN KRESS: One way I interpret the useful of this is if you did have FC criteria that

have to be met, this is a PRA thing that calculates it. Normally PRAs don't get down to the level of things like gap release, release from the other parts of the circuit that aren't core damage. And so this tells me that the PRA ought to deal with those things also if you have an FC criteria that goes down to those levels.

So, it does provide a useful insight in my mind.

MR. KING: Yes. And I guess if you look at a sodium reactor, the sodium water reaction is in a nonradioactive part of the plant. The intermediate loop versus the steam generator.

CHAIRMAN KRESS: And also the --

MR. KING: So a QHO isn't going to help you there.

CHAIRMAN KRESS: I also include this that you have to deal with all sorts of fuel coolant interactions like steam explosions.

MR. KING: Yes.

CHAIRMAN KRESS: And even the molten fuel on the concrete type of thing if it's applicable to your reactor.

MS. DROUIN: Okay. We ready to --

CHAIRMAN KRESS: Yes, move on.

MS. DROUIN: Okay. We're almost finished. We're almost ready to start to really getting to the--

CHAIRMAN KRESS: We almost gave you the ten minutes.

MS. DROUIN: Okay. This little cartoon here is supposed to say how do we take this initial idea of creating a new set of complete regulations that from the beginning are risk-derived and performance based. And that can apply to any reactor technology. You know, coming in and start writing these regulations, how do we get there, how do we know what to write.

So what the framework was supposed to do was to provide that process of how we go from this idea to actually creating these set of regulations. And we thought the process needs to define a goal, and at least define the guidelines and criteria for achieving that goal. And then that process has got to deal with completeness.

CHAIRMAN KRESS: Is that a Picasso?

MS. DROUIN: I'm sorry?

CHAIRMAN KRESS: Is that a Picasso on the left?

MS. DROUIN: Absolutely. That one viewgraph --

MEMBER POWERS: That's a Drouin. And in 20 years it will be valuable beyond price.

MEMBER WALLIS: So when you use the word "goal," you mean something you actually intend to achieve by imposing various guidelines and criteria?

MS. DROUIN: Yes.

MEMBER WALLIS: It's not the sort of goal that's talked about today where it's something that we try to get close to if we could. It's a real thing you're trying to do?

MS. DROUIN: Right.

MEMBER WALLIS: It's a measure of performance?

MS. DROUIN: Right. And that's what we're trying to show here. And so this process that's in the framework was let's define the goal, let's define the structure to identify the requirements, then let's define the guidelines and criteria to meet that overall goal within this structure. And then we do what we call you turn the crank where you implement all of this and out comes the requirements.

MEMBER WALLIS: So this goal --So that's what's shown across that top.

MEMBER WALLIS: -- to protect the public health and safety, you're going to very clearly tell

us what the measure of performance is there?

MS. DROUIN: Right. And that's where you come in and get into our level of safety. What is that level of safety we need to achieve to protect the public health and safety. And then what are those protect -- we called them protective strategies --

MEMBER WALLIS: Everything then follow from that goal? And once you have this goal, once you've defined your goal in terms of quantitative measure of public health and safety, is it your intent that everything else will follow from that?

MS. DROUIN: Basically, yes. Basically.

MEMBER WALLIS: Very much a top down type?

MS. DROUIN: That's right.

MEMBER WALLIS: Not adding things on at the bottom because someone felt like it and so on.

MS. DROUIN: No. That's right.

Then trying to put the structure of what kind of requirements that you need to ensure the public health and safety, that's where we came up in addressing the completeness is where we came up with these protective strategies. That if you had requirements that would ensure these protective strategies were met,then we felt that we have ensured the public health and safety.

And then the next one is coming up with the guidelines. What are the right probabilistic criteria? You know, defense-in-depth, PRA technical acceptability, et cetera. What are those things that you need in looking at each of these protective strategies? And then ultimately then you turn the crack and come out requirements for design maintenance and operation of the plant, whether they're technology-neutral or technology-specific.

So that's the process. So in looking at that --

MEMBER WALLIS: "Turning the crank" is a very old metaphor. You ought to use something from the electronic age, I think.

MS. DROUIN: Well, you're probably accurate. I'm not sure what that one would be, though.

MEMBER WALLIS: Well, if you implement some computer program --

MS. DROUIN: So the different technical issues that we dealt with in the framework which we're now going to get into that have this round table discussion, you know, the risk-derived probabilistic with a level of safety, with frequency consequence curve, defense-in-depth, PRA technical acceptability

and--

MEMBER WALLIS: Wait a minute. You're skip--

MEMBER POWERS: You want to go over defense-in-depth pretty quickly.

MEMBER WALLIS: You're skipping over all of this. Are you going to discuss these in details later --

MS. DROUIN: No, no. I'm saying this is now what we're going to get into.

MEMBER WALLIS: Okay. Thank you.

MEMBER POWERS: All right.

MS. DROUIN: So at that point I'm done with my overview.

CHAIRMAN KRESS: Good job, Mary.

MS. DROUIN: So I kind of wanted to paint the picture up here and put what we're trying to get to.

So each of these, for each topic, we only have a couple of viewgraphs to focus on what we think are the key issues. The ACRS is a stakeholder --

MEMBER WALLIS: Are you going to get back to these bullets? You've just skipped over each one of these things?

MS. DROUIN: Yes. We're starting right

now.

MEMBER WALLIS: Well, I'm just wondering if what you're going to give us is going to comprehensively address the bullets that you just skipped over, that's all.

MS. DROUIN: I think so. Try to.

MEMBER WALLIS: Okay. Okay. Thank you.

MS. DROUIN: So I don't know Tom how you want to -- you know, it was our understanding to just start walking through the framework and try to put some key viewgraphs, what we thought were key.

CHAIRMAN KRESS: I would say, starting with this I have a number of questions or issues with it that I could throw out. And then ask the Committee Members if they also. And then you could respond to these. Would that be a good way to proceed today?

MS. DROUIN: Right. And we tried to structure it that way.

CHAIRMAN KRESS: Okay. I think that's a good way to do it.

So just to get things started and I'll go ahead and throw my comments and issues here. And then turn it over to the rest of the members. If they also have additional comments. And then you can respond to these, okay?

MS. DROUIN: Okay.

CHAIRMAN KRESS: All right. Let's start with the step wise factors to this curve. There's really no need for it to be step boxed. It could be a straight line. And it could a straight line that's non-risk adverse because that's basically what you have there already. That's item number one.

Item number two that I would have about this is when you use it, I would call this an FC curve that's an aid for identifying licensing basis events. It's not a risk acceptance curve. That's a comment.

To determine licensing basis events I would agree that you need to talk about types of accidents and frequency ranges, but within those the ones I would select would be the ones that have the maximum product of FC, not maximum frequency or maximum consequences. That's another comment.

Another comment I would have with this is it's not good enough by itself because it doesn't summate the risk from all sequences. So I think you do need another FC curve of a different type. And that's that cumulative, that's complimentary cumulative distribution function curve. You do need that. And that should be your final test as to whether this thing in working.

And I maintain that you could make such a curve that's the technical equivalent of a CDF and a LERF but would cover the entire range of frequencies and consequences. And what I envision you would need to do would say you select a constant for your FC equal constant on this curve, you select your licensing basis events from that and you about assuring that the design meets those for the licensing basis events. But then you go to the CCDF curve and see if you meet that criteria. If you don't, you go back and iterate. You select a more stringent line for this thing, and make the design -- modify it so it has to meet that until you converge on meeting an appropriate CCDF curve.

Now, my last comment on this is I really don't the consequence being dose. And that's because that invokes Level III too much. You have to have some sort of site characteristics. And it's unfair I think to ask a designer, say something like a PBMR, to have a site in mind. Now I realize you can do this 80 percent bogus site. But that's not necessary. And what I think the consequence ought to be is radioactive release. I would call it curies, probably.

So those are my list of issues and thoughts and comments on this type of curve.

And with that I would ask if other Members of the Subcommittee would like to throw in some thoughts that may be different?

MEMBER WALLIS: I have a lot of comments.

I agree that the CCDF curve is really what measures the impact on the public. This does not measure the impact on the public of the cumulative effect of all the events possible.

And this is what people usually mean when they talk about an FC curve. You've introduced something here which is different from usual usage and is liable to be confusing. So I would like to keep FC curve to mean the CCDF versus consequence curve, which is what the Farmer curve and all those things --

MEMBER POWERS: Yes. I would call this the licensing basis F curve or something.

MEMBER WALLIS: This is a useful screen for looking at accidents to see if you need to go further with them.

I agree with my colleague about drawing a straight line.

I don't know what you mean by "dose." I mean dose is what's the public consequence of dose? How about number of fatalities?

And I don't see how you can cap at some

dose. I mean if you have enough release, you might kill a million people. Dose doesn't mean anything in terms of that.

CHAIRMAN KRESS: That's why I would use the release of radioactivity.

MEMBER WALLIS: Well, there's going to be release. And if you cap it, you're perhaps cutting off the worst possible accident, which is what the public is concerned with most. So I'm concerned about the use of this rather than CCDF curve.

I think it's a very useful screen for preliminary looking at whether or not accidents need more attention.

CHAIRMAN KRESS: I think it's a good aid for developing accident basing events, yes.

MEMBER WALLIS: I think the consequences need to be thought about very carefully. What are the public consequences? Can you record that just as a dose somewhere? Is that a proper measure of consequences?

MEMBER BONACA: Yes. What I don't understand here, since you call that a frequency consequence curve, why did you come up with this curve? I mean, my sense was that you're leveraging existing regulation and criteria, right?

CHAIRMAN KRESS: Yes, that's another comment I meant to make, by the way, that the particular curve you have is derived so that it's equivalent to the current regulations. And if you're actually using this for this new technology reactors, I don't think that's responsive to the desire to have a higher level of safety for new technology. But if you did what I said where you use it to select the initial license basing event and iterate on an appropriate CCDF curve until you meet the CCDF curve, I think that concern would go away. But I don't like the idea this new technology is made equivalent to current regulations.

MEMBER BONACA: Well, I mean I would like to understand more before. Because I've seen a lot of exchange of information.

For example, you know the debate has been do you need licensing basis events. And since you have a PRA, you could actually have a living PRA and warnings or whatever, but it seems to me that you chose that because there is a benefit of having some limiting events, then you address deterministically in a way and you anchor operations, tech specs and everything else that happens at the site on those license basing events, which is again similar to what

has been done for current generation of plants.

I fail to understand the logic behind the use of a curve like this. Which, again, I think it's leveraging whatever has been used in the past as well as this concept of deriving license basing events as limiting and then addressing them deterministically in comparing to this curve.

MS. DROUIN: Go ahead.

MR. LEHNER: Yes. Let me say a couple of things about the comments, and I'll address what you've said.

MEMBER BONACA: Yes. Because I mean I can see the points of my colleagues here, and I would like to understand your point. Because I'm sure you thought yourself a CDF curve could be a continuous curve.

MR. LEHNER: Yes. I mean, this is an example of a DCF curve. We're not saying that this is the one and only definitive CDF curve. Well, let's just call a CDF curve now --

MEMBER WALLIS: Don't call it that. That's even more confusing.

MR. LEHNER: What would you like me to call it?

CHAIRMAN KRESS: A licensing basis event selection curve.

MR. LEHNER: Okay.

MR. KING: The framework calls it frequency consequence curve.

CHAIRMAN KRESS: Yes, I know. That's confusing.

MEMBER WALLIS: Very confusing.

CHAIRMAN KRESS: Well, it is a frequency consequence.

MS. DROUIN: It is a frequency curve. It is.

MR. LEHNER: Okay. Now why did we choose--

MEMBER WALLIS: It's not a frequency curve. You can't integrate it and do anything to measure -- it's just a screen for looking at individual accidents. It's very different from what you mean by frequency and consequence. Frequency means the probability of something happening with a certain consequence. That's not what this is. It's a screen for looking at individual events. It's quite different.

You can't look at this and say that the probability of a dose of one is a certain probability on this --

MEMBER BONACA: But in your approach

you're still planning to integrate --

MEMBER WALLIS: No, you're not.

MEMBER BONACA: -- all the cities as to get --

CHAIRMAN KRESS: Well, they're going to get to that.

MEMBER WALLIS: This is not a probability distribution.

MEMBER BONACA: No, not from this. I'm not talking about into this curve. But certainly to come up with some magic criteria or figure of merit you'll compare to. It won't be CDF or LERF, it'll be something else. But --

CHAIRMAN KRESS: No. I view that curve as a figure of merit term. It's equivalent to the figures of merit.

MR. KING: Yes, it's not a cumulative curve.

CHAIRMAN KRESS: It's not a cumulative curve. It's --

MR. KING: It' ultimately is used for screening.

MR. LEHNER: Okay. First of all, why did we pick these points? As you said, we tried to have some basis in the current regulations. Now the

current regulations, of course, give you consequence numbers, it don't give you frequency numbers. So what we've done is we've looked at some areas in the current regulations, like Part 50 Appendix I, Part 20, Part 100 and they give you qualitative ideas as to the frequency when these things apply. We then assigned actual frequency ranges. So that's how we constructed the curve.

We thought about doing a straight line. You know, you can go either --

MS. DROUIN: Can I just? At one time we did have a straight line. I'm sorry. I just have to interject this. It's probably petty of me.

MR. LEHNER: Okay.

MS. DROUIN: But we got criticized by this group for the straight line and we went to the step.

CHAIRMAN KRESS: Oh, surely not.

MR. LEHNER: Well, we thought --

CHAIRMAN KRESS: What do you do when you decide you're wrong? Do you change you mind?

MR. LEHNER: If you go in a step like manner, you still have a basis for each one of these points. If you draw a straight line, someone can say "well, you know, what about these intermediate points?"

MEMBER WALLIS: What's the basis for ending it? I mean you mean to say that a dose of .001 rem released continuously from a reactor all the time is allowable?

MR. LEHNER: No, that's the second thing I wanted to say. This range and up to 100 rem, these are cumulative doses here. Millirem, sorry.

MEMBER WALLIS: That's cumulative, though, that's different.

MR. LEHNER: Yes, this is cumulative. And it's mentioned in the framework. It was just confusing to put it on the figure. But from here it's cumulative and down 10 to the minus 3, frequency of ten to the minus 3, these are cumulative. The 100 millirem here and the 5 millirem here are cumulative doses.

Also, the other requirement that the framework had --

MEMBER WALLIS: So excuse me. That means that you don't have a consistent axis. And some of these are cumulative and some of them are individual shots?

MR. LEHNER: That's correct. The way it's listed in the framework is that this is on a per sequence basis, but then there's an additional

requirement that in this range it's not just a single frequency, it's cumulative.

MEMBER WALLIS: But the per sequence bothers me. Because by playing with the PRA and changing the number of branches, you can come up with a different number of sequences. You could have a million sequences lying in this region.

MR. LEHNER: Right.

MEMBER WALLIS: That doesn't tell you anything about the CCDF curve, which is what you really want.

CHAIRMAN KRESS: Yes. Well, that's why you need a CCDF in addition to this.

Now, I have a problem with this curve. In fact, I view it like figures in merit in the current regulations with design basis accident.

I don't care where you put that curve. You can put it anywhere you want to and draw the slope anyway you want to. Select your licensing basis events from that. But it has to meet the CCDF curve. If it doesn't, you change.

MR. LEHNER: Well, right now --

CHAIRMAN KRESS: And you can do this on a design specific basis.

MEMBER BONACA: What is there right now.

CHAIRMAN KRESS: Yes.

MR. KING: The framework also calls for analysis to meet the QHO.

MR. LEHNER: Yes.

MR. KING: So when you populate this thing, it still has to meet the --

CHAIRMAN KRESS: That also bothers me. I don't like that because --

MR. KING: But the CCDF curves buys you more than that, I agree with that.

CHAIRMAN KRESS: Yes.

MEMBER WALLIS: Well, suppose all the points are clustered around zero here. Does that mean you have no design basis events? All the current points of all your PRA branches end up in a little box way down in the left hand corner, in the left hand bottom corner there. Does that mean you don't have any design basis --

CHAIRMAN KRESS: That's a good design.

MR. LEHNER: We do specify that you can add design basis accidents based on the designer and the reviewers.

MEMBER WALLIS: Oh, that's good. I like that. I like that.

MR. LEHNER: Because, you know, there are

situations that you come up with where --

MEMBER WALLIS: Right. The problem is by manipulating the PRA you can move stuff around in this space.

MR. LEHNER: Well, we mentioned that what was termed as consequence we expect to be at the functional level. And you'd have to be at -- for a specific technology, you would have to decide what constitutes a sequence. So you couldn't keep parsing it to reduce the frequency. That's certainly a valid concern.

MS. DROUIN: And we did a -- we had a lot of discussion on that. I mean, that was something that, you know, forget about these advanced reactors. It's a problem we have with current reactors when you use a PRA and you don't come in and define pretty precisely what you mean by a sequence. And you do get people cutting it real, real fine.

So we recognized that right away and we have attempted to put very prescriptive boundaries of what we mean by that so that you do not get someone slicing it so thin that they meet everything.

MEMBER WALLIS: Well, you could say you must have ten DBAs, no matter what. And they've got to be the most significant sequences based on some

evaluation.

MR. KING: Well, what we say now is you have to have a DBA, at least one DBA in each of the major event categories.

MEMBER WALLIS: Right.

MR. KING: Reactivity, insertion, coolant leak, you know a cool handling action --

CHAIRMAN KRESS: I think that's a good way to do it. Because what you're after is identifying the types of accidents you can have.

MR. KING: Right.

CHAIRMAN KRESS: And that gets to that. And then you say, all right let's look at the different things that fall in there and see which one's the worst. I would make it the worst FC product in there. But I think that's a good -- the purpose of this is to identify the types of accidents you can have in reactor design, and then selecting from those types some representative of that type so you can call them licensing basis events which has lots of advantages in terms of current regulatory system and how you define SSCs, and how you deal with defense-in-depth and margins. But it has lots of good points in my mind.

But, you know, after you do this you're

left where you were with the current regulations. You have a presumption that the reactor design is safe. And the only proof of that presumption is going to a CDF or a LEF or a dose or a QHO. So you need to go to that next step. And that's the CCDF curve.

MEMBER WALLIS: Will that tell us why you need a licensing basis events at all? Because this is based on selecting -- this is a measure of a safety of the system.

CHAIRMAN KRESS: No. It's a license-based event.

MEMBER WALLIS: Aren't you going to explain to us why you need licensing bases events? Because I thought the basis of this whole thing was public safety, which is really the CCDF curve.

MR. LEHNER: Well, I think one reason for licensing basis events is because we don't want it to be totally risk based. We want to have, as Dr. Bonaca pointed out, we want to select some events which in a sense are bounding events in their particular category. And yet we want to select those events on a more risk-informed or risk-derived basis than is currently done. So I think that's the bottom line of why we want licensing basis events.

MEMBER WALLIS: Well, these bounding

events come out of the PRA, don't they?

CHAIRMAN KRESS: Yes, but --

MEMBER BONACA: Yes.

MS. DROUIN: If we go back several years when this was first getting started, this was a policy issue that in using a probabilistic approach to this, did we want to in a sense abandon the concept that did we need DBAs. And it was decided way back when that no, we would not --

MEMBER WALLIS: I think you ought to revisit that. Because I've thought this quite a bit and I don't really see what you gain by --

MEMBER BONACA: I think what you gain, you gain a clear line for the operator, he has a plan.

CHAIRMAN KRESS: Yes, for his licensing basis.

MEMBER BONACA: He wants to know that he has that line he cannot cross. He puts it in tech specs. And he's tied to specific events he understands, he supports.

I mean for example the LOCA today in the environment of a power plant is a central issue. I mean that's always -- you're always referring to the LOCA because the LOCA sets a lot of margins and requirements. So there is a benefit and stability

there fore the operator.

I have been looking at some comments that were there and trying to understand how would I write a tech spec if I had, for example, variability of information coming in from changes at the power plant that are changing my tech specs, or things of that kind. And I really couldn't figure it out.

CHAIRMAN KRESS: Right. Now consider if all you had was the CCDF curve and you required the designer to meet that, then he could meet that very easily with some accident sequences that contributed very little to it. But by this process you make sure he looks at even those type of accidents. That he covers the whole range of it. And to me, that's sort of defense-in-depth concept. You make sure with this he looks at the kinds of accidents that could happen.

MR. KING: And he looks at it in a conservative way.

CHAIRMAN KRESS: And in a conservative way. So he may very well meet the CCDF curve and those may not contribute much. But at least you've thought about them. And that's --

MR. KING: Yes. There's other reasons for all these. Tom is right. The fundamental is we don't want a risk based approach.

CHAIRMAN KRESS: Yes.

MR. KING: But one of the ground rules going into this is we're not going to change Part 20, Part 100 and Part 51, these other things. But to implement Part 100 and Part 20 you need some sort of design basis events. You know, you need one for Part 100 for siting purposes. So show that you meet the limits for normal operations and anticipated operational occurrences, you need to identify what those events are. And this process will do that.

And we use it for safety classification and we use it to test the PRA, we use it to put some margin in the design for defense-in-depth. So there's a number of benefits in doing this.

CHAIRMAN KRESS: Let's talk about --

MS. DROUIN: You know, it got distorted --

MEMBER POWERS: I'd worry a little bit that maybe the questions suggest a position on the Committee that's not universal. I'd like to inject a couple of points here.

CHAIRMAN KRESS: Good.

MEMBER POWERS: First of all, I disagree with some on the Committee that the FC curve needs to be constructed to reflect the Commission's desire that new plants be safer than existing plants. I think the

curve's just fine as it is. I think that additional safety can come in other ways than the criteria established by the curve.

I agree with Mr. Wallis. I think DBAs are a dangerous concept because you design to the DBAs rather than design to the risk. I'm okay with them identifying types of accidents to look at.

I do not --

MS. DROUIN: Then, Dana, I'm confused. You don't -- I'm not sure I understand what you just said because I thought you just said that you don't like --

MEMBER WALLIS: Because he's agreeing with me, that's the problem.

MS. DROUIN: -- like them today, but he liked them.

MEMBER POWERS: Say this again.

MS. DROUIN: I thought you just contradicted yourself.

MEMBER POWERS: No. I said that I don't like the idea of design-basis accidents. I don't mind identifying types of accident, but I don't like the concept of a design-basis accident or a design-basis event.

MS. DROUIN: Okay. But --

MEMBER POWERS: Because you design to it.

And that's what gets us in trouble with DBAs. That's what got us in trouble with the double-ended guillotine pipe break and that's what will get us in trouble here, too.

MS. DROUIN: We deliberately did not use the term design-basis accident.

MEMBER POWERS: Yes. But you use event, whatever you --

MS. DROUIN: But the reason we didn't use that term is because in identifying the licensing basis events and the approach that we used to identify them, we tried to recognize that since they're coming from using your probabilistic criteria to identify them, that they an change over time because your design may change over time.

MEMBER POWERS: Fine.

MS. DROUIN: And so they may change over time.

MEMBER POWERS: But I find it dubious that any of this can be used. I look at the new designs for light water reactors, and they're coming in with CDFs or events that are exceptionally low. And that tells me that the risk is going to be dominated by those things that the PRA treats very poorly: Aging, defects in construction and external events.

How are you going to use this to understand the risk of a plant if the PRA simply doesn't treat those things?

And finally, I'll just say that if operators need a clear line -- I think it's where you said it -- I don't think the regulatory system needs to set lines for the operator.

MEMBER WALLIS: Can I go back to something my colleague said; the things that the PRA treats very poorly? It's not clear to me what in your DBEs is treated any better than is in the PRA. And if the PRA contains all accidents which you've conceived, DBEs are simply a selection of those; what are you going to do with them which is different from what you do with them in the PRA?

MEMBER MAYNARD: Just a minute. He's having trouble over there.

MEMBER WALLIS: Is he having trouble? Why don't you lean forward more close to --

MR. LEHNER: Sorry. I lost my train of thought.

What we do with the DBEs is that we add some conservatism to our calculations because we assigned them a consequence and a frequency which is the highest in their group. So it's the actual

individual sequence is likely to have a lower consequence or a lower frequency, but we assign a DBE the highest frequency and the conservative assigned frequency --

MEMBER WALLIS: So what you do is presumably the analysis of these things in the PRA is as good as it is in your DBE. It's as if you've taken the §50.46 thermal hydraulics and put in the PRA so that we don't have a set of accidents which are analyzed not quite so well. The PRA is comprehensive. And where it needs to be, it does realistic thermal hydraulic analysis, too, which it doesn't do today.

If you do that, then it seems to me your DBEs are simply a subset of PRAs in which you arbitrarily set certain probabilities as one instead of something else. It's a sensitivity study. It's a health stream study.

MR. LEHNER: Well, we don't necessarily find -- set the probabilities to one. It's not the current --

MEMBER WALLIS: It said you looked at the worst case or something.

MR. LEHNER: Right.

MEMBER WALLIS: The only way you can do that is to sort of change some probability, isn't it?

Otherwise it's already in the PRA.

MR. LEHNER: It's in the PRA but we see if you can meet that scenario at a -- if the frequency of that scenario is increased, will it still fall within the --

MEMBER WALLIS: Okay. The sensitivity study. It's like saying we've got --

MR. LEHNER: The sensitivity, yes.

MEMBER WALLIS: -- we've got the PRA and it predicts the double-ended guillotine break, forget it. Because the probability of the initiating event is so tiny. What the regulations do now is they say "oh, no we can't do that. We're going to set the probability of an initiating event as one." And then you're going to have to do an analysis which shows you can stand it. It's a sensitivity study --

MR. LEHNER: But not to that extreme. Not to that extreme. In other words, we don't set the probability equal to one anywhere. We --

MEMBER WALLIS: Do you set it equal to something else?

MR. LEHNER: Yes. We set it equal what the sequences in that class, what they're actually --

MEMBER WALLIS: Okay. So it's like saying we won't set the double-ending guillotine break at ten

to the minus eight. We'll set it at ten to the minus 4 because large break LOCAs average out to that.

MR. LEHNER: That's an extreme example, but --

MEMBER WALLIS: Okay. I think I understand that now. Thank you.

MS. DROUIN: I'm concerned with the comment, Dana, that maybe you think it dubious that this can be done because of things that the PRA doesn't treat well. I think some of these things can be treated better in PRA and should be treated better in PRA. There are things that we recognized that if you truly want to go this risk-derived approach, it means how we do PRAs and use them is going to be very different from today. And people have to really understand that. And I don't know that, you know, the community at large, whether it's the regulator or the industry side of the house, understand that to go this risk-derived approach means that what's going to have to go in that PRA is going to be different from today. And that's why we really wanted to use this word "risk-derived," because we're taking a set of regulations that are deterministic base that we look, that we feel confident that we've ensured the public health and safety, et cetera. And now we're going

this other way. We're using a lot of the insights from the PRA in a very fundamental way. Not totally based, because we brought in deterministic and we've, I think, gone further in terms of establishing defense-in-depth to make sure we're not risk-based. But we still have the bar, and that really means that you're going to have to raise the bar in terms of what we're going to accept out of these future PRAs.

MEMBER POWERS: You haven't even got the technology for doing some of these things. How do you incorporate aging into a PRA? How do you incorporate defects of construction and materials manufacture into a PRA?

MS. DROUIN: I would answer that more by saying those would cause me problems if I was going to be absolutely exclusively in making all my decisions based on the PRA. But we're not. And I think we have to remind ourselves, and remind you guys, that we're not making this exclusively based on the PRA.

MEMBER POWERS: Yes, but the trouble is I think you're going to be making your decisions based on a PRA that it's just not very useful to you. Because I mean I see these designs, especially for the sodium reactor, in which the equivalent of a core damage frequency is ten to the minus eight for

internal events. Practically impossible. It's a big pot of sodium. If you knock a hole in the pot, it drops the level of sodium about 6". You know, from internal events it's just nothing.

What's going to dominate this is going to be external events or we're just not building it right.

MEMBER WALLIS: Or maybe human errors.

MS. DROUIN: Would I interpret --

MEMBER POWERS: And then you get into the -- I mean, the way they're designing it they're saying, "Okay. If we have an event, the operators can go home, spend the weekend, get to know the family and kids and whatnot, and come back on Monday morning and we'll handle this thing." And so what's going to happen, it's going to be dominated by human errors of commission that they can treat at all. And so you're dealing with PRA that becomes as much as a fiction as the double-ended guillotine pipe break.

MS. DROUIN: I really don't agree with you. We can get into that debate on the specifics of that at another time.

But if I translate what I think you're saying, and I want to make sure I understand what you're saying, is that if I take what you said to its

conclusion, is I hear you saying we should not be using PRA at all in our decision making.

MEMBER POWERS: I question how you're using it. Not too vigorously, by the way. But I think you're neglecting some of the real advantages of the PRA and looking at what components and systems achieve safety for you. And you're looking at these end points, the CDFs, the LERF equivalence and things like that rather than the risk-achievement, risk-reduction.

MS. DROUIN: Well, we're going to get to there. Because we're doing that, too. We're using the risk insights to help us on our safety classification looking at, you know what are those systems and components that are what --

MEMBER WALLIS: I would think that you would use the PRA, too. It's a model plant.

MS. DROUIN: We just haven't gotten to that part of the discussion.

MEMBER WALLIS: It's a model of the plant and consequences of events. You could look at some of Dana's errors of commission and suppose he operated at something really foolish or misguided, you know so follow it through and look at the consequences of it.

You've got a model for the plant as well

as just some risk evaluations.

MR. KING: The problems you're bringing up exist in today's regulations.

MEMBER WALLIS: Right.

MR. KING: It's not unique to using PRA.

MEMBER WALLIS: Why don't you look at your PRA and say suppose we make this probability of an operator doing something foolish one. What happens? You do that all the time, don't you?

MR. KING: Yes, you can do that.

MEMBER WALLIS: Right.

MR. KING: Yes. But I think we're using defense-in-depth to try to take care of these completeness. Because that's the main reason we've got the defense-in-depth principles in here. And you can quibble with whether we've got enough, but they're in there to try and address this once you bring it up.

MEMBER WALLIS: The problem is how do you put in everything that you need to put into it? If you put in everything that effects the safety of the plant, then presumably you've covered everything. You're including Dana's problems. You've put in aging, the PRA changes because of aging, presumably, year-to-year or day-to-day if you can model it properly.

MR. LEHNER: I mean, just to cover it further on the use of the PRA, I mean I think as we say elsewhere in the framework, I mean especially for these new technologies the PRA certainly is a tool for trying to discover new threats and combinations that you wouldn't have thought so, and it's a very systematic way of looking for unique accident situations.

And also, you know we talked before about perhaps you have such a good design that all your DBEs show zero consequences. I mean, you could still select the design or a licensing basis event. What you would do is you would then select an event that tests the design feature, the least of the zero consequences, and you could use that to see what would happen if that particular design feature which you're so relying on to get those zero consequences didn't work as the designer expected. I mean, that would certainly be an important use.

MEMBER MAYNARD: I've got just a couple of comments.

First of all, on the graph I could care less whether it's a straight line or a stair step. I personally like the stair step a little better because it's a way to tie it together in a way that makes

sense. So I personally like the stair step better, but if you want to make it a straight line, that's fine.

I do like the idea of not relying totally on the PRA. And I like of concept of I don't care whether we call it DBAs, licensing basis events or whether we use to pick sequences. I think it's going to be important that we use this to be able to pick some of the things that are going to ultimately be needed to establish procedures and processes and stuff to be used in the plant.

I'd hate to get in a situation where basically every decision to have to plug in a decision or procedure change into a PRA to see if you can do it whether or not. You're going to have to establish some procedures and processes in the plant. And whether that's based on a DBA or licensing event or whether it's sequences that come out of this, there is going to have to be some selected rather than just have kind of an infinite thing.

So I think I'm not in disagreement with your approach there. And I think we could probably debate whether what we call them and how many of that them we have stuff, but I believe that we still are going to end up some licensing basis events, or at

least licensing basis sequences that have to be reviewed and approved there.

MS. DROUIN: Yes. I mean one of the things that we did not have a viewgraph on, and maybe during the break I'll make a viewgraph of it. Because you know right now in looking at this probabilistic approach and looking at these curves and everything where we're going to the next slides, is you know the selection of what we call these licensing base events. And I said at some way in the past when we were first -- we had quite a bit of discussion on whether or not we should abandon the concept of a DBA, and it was decided not to. Good, bad or indifferent that was the decision.

In getting to --

MEMBER WALLIS: Did you follow it through what would happen if you did abandon it and what would things look like?

MS. DROUIN: Well, we had quite a bit of discussion with this Committee. And not to nitpick again, but the Committee also agreed that we shouldn't abandon the idea of DBA.

MEMBER WALLIS: I think rather than set --

MEMBER POWERS: Well make a decision on the Committee, did not agree --

MEMBER WALLIS: Yes, I agree with him. I don't see that you have to have DBAs. I think they need to be justified. And you have to look at a situation where you don't have DBAs, what are you giving up and then justify why you have to have the DBAs.

To make a decision up front that you've got to them I think is false.

CHAIRMAN KRESS: I am on the other camp. I think you need the DBAs as a defense-in-depth concept. You've got to look at all accident types. And this allows you to look at those that are not very risk significant. And at least have some way to incorporate margins. I presumed what you would do is treat this like figures of merit and for your license basing events you would have either conservative ways to calculate each one, which is separate from the PRA. You would have the conservative methods to calculate each design-basis or LBE. And if it were going to best estimate, you might even specify an uncertainty with 95 percent there. So it gives you margins, it gives you defense-in-depth and you can go to the CCDF curve, just as a check to see that you also have appropriate risk. Because that sums them up. And you can use some defense-in-depth as a CCDF curve because

you can specify that it has to be met at some level of confidence.

MEMBER WALLIS: Tom, but you said it's going to be separate from the PRA. But if the PRA is good, as good an analysis of the event as you need, why do you need to have a separate event, separate analysis of that event?

CHAIRMAN KRESS: I don't think it's going to be.

MEMBER WALLIS: I mean if the --

CHAIRMAN KRESS: I think you need to design--

MEMBER WALLIS: The current --

CHAIRMAN KRESS: Do it like design-basis events.

MEMBER WALLIS: The thermal hydraulic analysis is the same in the PRA as it is in your DBA.

MEMBER APOSTOLAKIS: But you can't have thermal hydraulic analysis for 10,000 sequences.

CHAIRMAN KRESS: That's right.

MEMBER WALLIS: That's it. You see, that's it. It's unyielding. That's the problem.

MEMBER APOSTOLAKIS: That's the practical--

CHAIRMAN KRESS: Oh, yes.

MEMBER APOSTOLAKIS: So you are defining--

CHAIRMAN KRESS: I'm talking about you have to do this outside the PRA.

MEMBER APOSTOLAKIS: You are defining bounding sequences for selected intervals. That's really what it is.

CHAIRMAN KRESS: Right. Right.

MEMBER WALLIS: But I don't think you should have an analysis which is somehow completely separate from the PRA --

CHAIRMAN KRESS: No, no, no.

MEMBER WALLIS: It would have to go with it. That doesn't make any sense.

MEMBER APOSTOLAKIS: Yes. The so called acceptance criteria, it seems to me, should not be applied here.

MEMBER WALLIS: No.

MEMBER APOSTOLAKIS: At least at the beginning.

MEMBER ABDEL-KHALIK: I mean I view this graph as a way of identifying those limiting events and saying that, okay, we're going to do the detailed analysis for those. At the end of the day when you do the integration and find out what the cumulative risk is, we're also saying that regardless of what the

cumulative risk will be, we will not accept a plant design in which events of relatively high consequences would have probabilities exceeding a certain value.

CHAIRMAN KRESS: And you have to beat both curves.

MEMBER ABDEL-KHALIK: Right. And therefore, I like the idea that this graph is sort of tied into current regulations, just my colleague here say. The problem I have with this is that it does not separate design acceptance from site acceptance.

CHAIRMAN KRESS: Oh, I have a problem with that, too. I think those ought to be separate.

MEMBER ABDEL-KHALIK: And what my colleague suggested, you know changing the abscissa on this curve to something other than dose, for example curie, I have some difficulty with how one would go about implementing that. Because, you know, a curie of tritium is not the same as a curie of polonium-210. And therefore, it would be very difficult to have a graph where this is purely a design related graph. Somehow you have to tie it to a quantitative measure whether it's rem or man-rem. And if that is the case, then it would seem more logical to sort of forget about having a purely --

CHAIRMAN KRESS: I agree that all curies

are not the same.

MEMBER ABDEL-KHALIK: Correct.

CHAIRMAN KRESS: But what I had in mind there was there such a thing as a teddy, and this applies to dose. But what it does is corrects the dose due to different isotopes, the type dose. I think you can back that out and say all right, so many curies of this type isotope and this, and this and this one. You could actually have a selected set of fission products and actonides that have a weighting factor to them for this. And it's not straight forward that it goes straight to curies.

MEMBER ABDEL-KHALIK: But you can get around that problem by, you know, with sort of thoughtful preparation coming up with a standard site against what you --

CHAIRMAN KRESS: Well, that's what they intend to o.

MEMBER ABDEL-KHALIK: I believe what you're suggesting, Tom, was done at the waste disposal arena.

CHAIRMAN KRESS: I think you're right.

MEMBER ABDEL-KHALIK: Where they define this arc which is a weighted average of various nuclides and so on.

CHAIRMAN KRESS: Yes. It certainly can be done.

MEMBER APOSTOLAKIS: Are you discussing the overall approach or specific curve?

CHAIRMAN KRESS: We're starting from this curve, George, and everybody's throwing out their concerns and issues with it. And if you have them, you're welcome to jump in right now.

MEMBER APOSTOLAKIS: I thought you advocated a three region approach. Tolerable, you know, unacceptable and acceptable. How is that reflected on this curve?

MR. LEHNER: The three region approach I think that you're referring to is the level of safety question.

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: No, no, no. It's the frequent and infrequent.

MR. LEHNER: Or is it the infrequent, frequent and rare, is that what you're --

MEMBER APOSTOLAKIS: No. He's talking about the QHO.

MR. LEHNER: The level of safety.

MEMBER APOSTOLAKIS: Yes, level of safety.

MR. LEHNER: That's what I thought, yes.

Okay. Well, I mean we're saying that you have to be in the least region, the desirable region, I guess,

MEMBER APOSTOLAKIS: Of this acceptable region here, I see only two regions; unacceptable and acceptable. There is no tolerable in between where you would apply cost benefit to reviews.

MR. KING: You don't apply cost benefit on initial licensing. When you get back in to making changes after it's licensed, you apply cost benefit.

MEMBER APOSTOLAKIS: No. No, you do. Because you can say for example here is the acceptable region. And for one sequence it happens that I am above this line. Then if you have this tolerable region, the licensee or the applicant may argue successfully that it's not worth pushing this down because of the extraordinary cost and the frequency there is tolerable anyway. That's the whole point of this.

It's not unacceptable in the sense that you either fix it or we reject your design.

MR. KING: Well, he may argue that and he may cost as part of his argument. But we don't have any rule like the backfit rule that applies to initial licensing.

MEMBER APOSTOLAKIS: Then you are not using the three region approach, so why are you carrying that?

MS. DROUIN: We were not proposing to using the three region approach in identifying the licensing base advance. We were not proposing that. I never have proposed that in terms --

MEMBER APOSTOLAKIS: So where are you using it.

MR. LEHNER: The three region approach is simply to indicate that the framework aims to develop regulations which will put a new plant into the least risky region, the desirable region. I mean that was the purpose of the three region approach.

Now if you were trying to translate that into this FC curve --

MEMBER APOSTOLAKIS: That's not an approach, though, John. It's just a philosophical --

MS. DROUIN: Yes, I was just going to tell you there was never an approach. We never had a three region approach.

MEMBER MAYNARD: I thought that was part of you defense-in-depth on the safety, security and preparedness expectation. That's where --

MS. DROUIN: That's right. I mean there

was not an approach. What we were saying is that you can look at risk in three regions. You have this region you don't want to be in. You have a region that, you know, tolerable and then you have the desired. And we're saying for the framework we're going to construct a structure that will force you to be in the desirable region.

So we never had a thing called a three region approach.

MEMBER APOSTOLAKIS: Well, then it should be rewritten. Because this part i sa little misleading. Because it says three regions.

MEMBER MAYNARD: Yes. In a status update where you was talking about, again, a part of your safety, security and preparedness expectation for defense-in-depth is --

MS. DROUIN: No. I am aware of the figure. And if you understood that's what we were doing, then that was bad communication on our part. I mean, you're talking about this figure right here.

MEMBER APOSTOLAKIS: Yes.

MR. LEHNER: I think it was entitled "Three Region Approach."

MS. DROUIN: Oh, no. It's not my hand.

MEMBER APOSTOLAKIS: Wait a minute now.

This is a very important point. Because what you have here is you have --

MS. DROUIN: We've got this document on a memory stick. We're going to pull it up so we can see some of the stuff.

MEMBER APOSTOLAKIS: You have staircase which comes from existing regulations, right?

CHAIRMAN KRESS: Right.

MEMBER APOSTOLAKIS: So one question might be why, you know, develop it that way. But you can argue against it and say -- no, no, you can argue that this is okay because I can use 95th percentiles and make sure that the new designs will be better.

But there is another question here. Presumably since these are deterministic requirements under whatever their limits, Part 100 and so on, the existing plants do comply, don't they?

MR. LEHNER: To this curve?

MEMBER APOSTOLAKIS: Not to the curve. Well, I guess in some sense to the curve, too. But when you say that this comes EPA such-and-such, don't existing plants meet that?

MR. LEHNER: I think the existing plants meet this in the way it's characterized in the current regulations. What we've done here is we've taken the

consequences, if you like, and the current regulations they are qualitatively discussed. We've assigned certain frequencies to them.

MEMBER APOSTOLAKIS: Right. Right.

MR. LEHNER: That's --

MEMBER APOSTOLAKIS: But presumably the existing plants even in a qualitative sense in one dimension meet the requirements of guarding what is triggering and what is AOs and all that stuff, isn't it, in Part 100 or Part 50.34?

MR. LEHNER: Not the Part 100 we do.

MEMBER APOSTOLAKIS: No.

MR. KING: Beyond that there are no requirements. This is new beyond the Part 100 dose.

MEMBER APOSTOLAKIS: The thing that is really of interest here is that you have a number of-- we have the goal of ten to the minus four for how much frequency. A number of the plants even though they meet the deterministic regulations, violate that power. In fact, a significant number and we tolerate it. So de facto there is a tolerable region in risk--

MEMBER WALLIS: Well, we asked Mary about that earlier, and she said the goals are to be met. We asked that --

MEMBER APOSTOLAKIS: Well, and that's what

my question is here. I mean what do you do? The fact that the agency does have a tolerate region in risk.

MEMBER WALLIS: A kind of grandfather clause. I think she's saying in the future they're going to have to meet the goals, isn't that what you said to me?

MEMBER APOSTOLAKIS: Until one design does not. I mean, come on. And then there will again be some exemption, some arm waving that come on, he really doesn't matter. Does you really believe it's ten to the minus six? It could be, you know, a little less. It happens all the time.

MR. KING: Yes, but NRC has no regulation on CDF or any other risk --

MEMBER APOSTOLAKIS: It's a goal, though.

MR. KING: It's a goal? But the --

MEMBER APOSTOLAKIS: Yours is a goal. Is it a criteria?

MR. KING: These would be regulations if you go forward and do a rulemaking.

MEMBER APOSTOLAKIS: Criteria. These will be criteria. You have to demonstrate you meet them?

MEMBER WALLIS: Yes.

CHAIRMAN KRESS: Yes.

MR. KING: In terms of 95th percentiles?

CHAIRMAN KRESS: Well, that hasn't been spoken about now.

MEMBER APOSTOLAKIS: So when did we start dreaming?

MEMBER ABDEL-KHALIK: There's no mean value.

MEMBER APOSTOLAKIS: This is absurd. This is completely absurd.

MS. DROUIN: Explain it.

MEMBER APOSTOLAKIS: I mean you can give me your 95th, I can give you my 95th and we debate forever what the right number is.

CHAIRMAN KRESS: No, no. This is a PRA. This is like the design basis --

MEMBER APOSTOLAKIS: I just -- the practicality of requiring that something like this will be implemented on the basis of 95th percentiles or means and that it will be a stringent criteria is just not there.

MEMBER WALLIS: But it's even worse if everything is debatable the way you describe it.

CHAIRMAN KRESS: Look, George, I think you're making --

MEMBER APOSTOLAKIS: But day one we said these lines are not bright, right? From day one, 1977

when we starting thinking about this, the lines are not bright. Now we make them bright.

CHAIRMAN KRESS: George, think of this line as the equivalent of the figures of merit in the current design basis accident. It's the technical equivalent of those figures of merit. They are bright lines. They are not --

MEMBER APOSTOLAKIS: They are?

CHAIRMAN KRESS: Yes, they are not tolerable --

MEMBER SHACK: 2200 F.

CHAIRMAN KRESS: They're bright lines.

MEMBER APOSTOLAKIS: And what I'm saying is that in risk space --

CHAIRMAN KRESS: This is not in risk space.

MEMBER APOSTOLAKIS: It's not?

CHAIRMAN KRESS: No.

MEMBER APOSTOLAKIS: Well there's frequencies there.

CHAIRMAN KRESS: What you have to do is estimate the frequency of these things.

MEMBER APOSTOLAKIS: Yes.

CHAIRMAN KRESS: That only --

MEMBER APOSTOLAKIS: And that is subject

to uncertainties. This is subject to all sorts of things. And --

CHAIRMAN KRESS: Yes, but it's like design basis accident. You specify that the calculations for frequency and the calculations in this case dose, but I would have curies, are to be done either in a very conservative way or you have to do an uncertainty analysis and then specify some level of --

MEMBER APOSTOLAKIS: Like the 95th percentile --

CHAIRMAN KRESS: Like you do in the best estimate calculation for LOCAs. Now they only require you to -- they don't require you to calculate the frequency there.

MEMBER APOSTOLAKIS: I don't believe that's going to work. Think they should be --

MEMBER WALLIS: But George, why shouldn't you apply the same criteria of acceptable to frequency as you do to thermal hydraulic calculations? Why is it in some other world that we have to prevaricate about it all the time.

MEMBER APOSTOLAKIS: These frequencies have a hell of a lot of judgment in them. And if you specify a -- I mean, ultimately risk-informed means that you are forming an opinion about the whole thing

by looking at a lot of things.

MEMBER WALLIS: Well, there's judgment about using a heat transfer correlation. And there's all kinds of those things, too.

MEMBER APOSTOLAKIS: Well, because you guys live in a dream world. You never put uncertainty on these things.

MR. LEHNER: And you don't want to go into that, do you?

MEMBER APOSTOLAKIS: I don't want to go into it.

MEMBER WALLIS: Well, welcome, George. We'll bring you in.

MEMBER APOSTOLAKIS: I just don't think it's going to work out. And lots --

CHAIRMAN KRESS: How would you select the design basis accident?

MEMBER APOSTOLAKIS: It will be risk-informed again.

CHAIRMAN KRESS: That is risk-informed.

MEMBER APOSTOLAKIS: But I would not demand that the frequency be at the 95th percentile less than this. That's where the tolerability comes into the picture. That if you go -- I mean, it's stated beautifully in 1174. As you approach the line,

there will be increased management attention, period. There's a warning. But very wisely they're not telling you what that management attention will be. But the message is clear.

We're going to debate this. We're going to scrutinize it. You have to convince us.

CHAIRMAN KRESS: Well, my approach to deal with that, George, is you select their licensing base events and your method of determining your figures, whether they meet the figures, they may or may not, and that's conservative or uncertainty. Then you go to the CCDF curve and then you acquire a very good PRA with uncertainty analysis and you say you have to meet that CCDF at some level of confidence.

MEMBER APOSTOLAKIS: And again, even--

CHAIRMAN KRESS: That deals I think with--

MEMBER APOSTOLAKIS: But even that comparison will have to be in a judgmental way.

CHAIRMAN KRESS: Well, anytime --

MEMBER APOSTOLAKIS: I mean it's never one thing. It's never the PRA that convinces --

CHAIRMAN KRESS: Anytime you deal with acceptance criteria, you're going to have to bring in a level judgment. I mean there's no technical to say this acceptance criteria is the right one. It's a

judgment. It's a --

MEMBER APOSTOLAKIS: It should be stated in such a way that there will be some latitude in making the decision.

MEMBER WALLIS: We all follow that. Try telling that to a policeman when you're speeding on a highway, huh.

MEMBER APOSTOLAKIS: Speeding on a highway does not involve polling experts to tell me the frequency of my brakes. I either measurement or I don't.

MEMBER POWERS: I don't understand quite, George. If I came back in and told you that my frequency of small break LOCA here is one. It's enough.

MEMBER APOSTOLAKIS: Yes. I say no.

MEMBER POWERS: If you tell you and said it was .1, you'd say no. Those are bright lines. Why can't I set it at ten to the minus four a bright line?

MEMBER APOSTOLAKIS: Because then I will say maybe

MEMBER POWERS: Oh.

MEMBER APOSTOLAKIS: And when I say maybe the we have a problem.

MEMBER POWERS: Okay. So it's real easy to

set this, Mary. Just interrogate George. When he says maybe, then go one little decade higher than that, then that's a bright line.

MEMBER APOSTOLAKIS: I really don't understand. First of all, I don't --

MS. DROUIN: I'm confused here. And the reason I'm confused is that when you Reg. Guide 1174, Reg. Guide 1117 there's a decision process if you want to go change your licensing basis. And so in changing it you want to, of course, look at what's going to be the change in risk. You want to look at the delta and then also you want to meet your thresholds. And having those as not bright lines under that context makes sense because you're trying to change something that you already have there.

What we're doing here, we're not trying to change something. What we're trying to do here is decide now it's two different debates whether or not you even have a concept of a DBA or a licensing base event. But given that you want to maintain that concept, then we're saying how do you use your risk information to help you select those.

So what was being done in 1174, I mean how do you have management attention that -- you know, it's just a different concept. It doesn't --

CHAIRMAN KRESS: It doesn't make sense.

MEMBER POWERS: It doesn't make sense.

MEMBER APOSTOLAKIS: You may not be able in a design to demonstrate that when the number of consequences is ten, the frequency is what you wanted. It may be a little higher due to uncertainties.

You're talking about new designs. There are crazy ideas of using microturbines for extra power, of using nitrogen accumulators, of using squib valves; all sorts of uncertainties.

MS. DROUIN: That's right.

MEMBER APOSTOLAKIS: And you're going to tell them show me that the reliability is this? This is not realistic.

MS. DROUIN: I disagree. I think that when you're dealing with new designs because you have these uncertainties there, that to use an approach that you're coming in at your initial design stage using your PRA to help you select those. And now as you move from design state to construction and operation, you're operating the plant. Now you're being forced as you manage that plant as the licensee manages his plant and does the things that he has to be doing. And as we oversee it. That are they truly meeting the conditions under which they were designed?

So if the risk starts risk, they have a choice. You know, they go mega modification or all of a sudden they've got a new licensing base in there that they've got to now meet.

So this --

MEMBER APOSTOLAKIS: This is very idealistic. I think the best --

MS. DROUIN: I don't think it's idealistic at all.

MEMBER APOSTOLAKIS: -- is to have a pilot.

MS. DROUIN: Now, we do agree that you should pilot this stuff. Absolutely should.

MEMBER APOSTOLAKIS: But this is a critical thing in my opinion. You're going now the direction of risk-based --

MEMBER ABDEL-KHALIK: But I think from a designer's perspective I like the idea that this line is a bright line. If I was a designer, you know, starting the process I go through, figure out some sequences and I find out that I'm in the unacceptable region, I say "uh-oh, I'd better go back and change the design" before proceeding further.

MEMBER APOSTOLAKIS: It is not as simple as that, Said. You have reactors that have new ideas

in them. You know, gas cooled fast reactors, you have other things. You know, GNEP now is coming along. There are questions about common cause failures. I have designers in my place, you know, getting very frustrated when I tell them beta cannot be less than that. And they say "Tell me what to do." There is a lot of uncertainty. Then they propose these innovative things like, you know, micro-turbines have not been used yet. And then I hit then back and I say how about the NRC staff, what are they going to say about this? You know, then they say "Well, then I'm going to use it." And it's not one sequence. It effects a lot of the PRA. It's not just one sequence where you say, okay, you know add something as a defense-in-depth and reduce the --

MEMBER WALLIS: But, George, if you have a fuzzy area it doesn't help. Because then it means there's a tension. Well, it depends on NRC person you talk to. It depends on who happens to be the manager this week and all that. That's no way to regulate.

MEMBER APOSTOLAKIS: The designer will do his or best to make sure the bulk of the distribution is way below. But if you force a guy to start arguing about --

MEMBER WALLIS: That means 99 percentile?

MEMBER APOSTOLAKIS: -- percentiles --

MEMBER WALLIS: Way below his 99th percentile? What is way below?

MEMBER APOSTOLAKIS: That's a judgment thing. That's my po;int.

MEMBER WALLIS: Oh.

MR. KING: But, George, the problems you're talking about don't exist whether you use this approach or some other licensing approach.

MEMBER APOSTOLAKIS: Or you use this approach and you don't claim that this is a criteria.

MR. KING: But this approach takes a comprehensive way to try and look at all the sequences and estimate the answer using more information than the old way.

MEMBER APOSTOLAKIS: I never doubted that. All I'm saying is using them as bright lines is not realistically.

MEMBER MAYNARD: But I think the regulatory process it is a legal process. And I think bright lines have to be set. There has to be provisions for that how can you move around that, but that has to be the exception rather than the rule because it is a legal process.

MEMBER APOSTOLAKIS: Think of the

practicality of implementing this.

MEMBER CORRADINI: I'm late and so you've probably answered this. So I read this whole document and I kept on tripping over the word risk-derived. And so, all right --

MS. DROUIN: You did miss that part, but that's okay.

MEMBER CORRADINI: Okay. But I interpreted it is that once you do this process the sequences that you choose are the ones that the designer will be held accountable for the design, not the methodology to choose the sequences. Am I misinformed?

MS. DROUIN: No.

MEMBER CORRADINI: In other words, I'm going to take two practical examples. Long ago Clinch River was licensed, kind of, right? And Fort St. Vrain was licensed for sure. If you were to apply this methodology, would you have come up with different accident sequences to regulate on for those two real plants? If the answer to that is yes, I'd be curious what they are. If the answer is no, then you essentially are taking a technique and using it very properly so if you get another unusual design beyond those two. But I guess that would be, my way is

empirical.

You have two plants back in the '70s that you licensed. What if you applied this to those two plants, what would you get out of it?

MS. DROUIN: Let me answer it. I think I'm going to answer it, but a different way.

If you go to Appendix E of the framework document, we did do a test case. We didn't apply it to Clinch River. We applied it to a current LWR. And if you applied this where we had a PRA available what would come up. And we did identify some events that were not addressed currently they would have to address.

It's been a while since I've looked at this Appendix, and I'm going to let Bruce over there who was our primary person on the team that did the test case for us.

MR. MRORCA: This is Bruce Mrorca from ISL.

That test case did show consistency to some degree between the current design basis events and those that were derived from the framework processes. But there were also differences. Clearly some of the frequency consequence curve criteria were not met. There were a few events that did not meet

the defense-in-depth criteria. But there were also additional events that were identified that would be out of scope into today's framework like station blackout or ATWS events that would be identified as licensing basis events.

So you saw both a combination of additional licensing basis events that were of high consequence that would have been excluded because of common cause considerations or essentially using a single failure of the original design basis events. And you saw those included as licensing basis events. And you saw some rare events like large break LOCA with a simultaneous loss of off site power being excluded because those have such a low frequency that they would not have shown up as a licensing basis event or design basis event.

So there is a combination of new and reduced in that mix.

MEMBER CORRADINI: So then I started with my question and maybe I'm incorrect. So then if you had done this exercise with the light water reactors, and let's say this is a light water reactor Prime, it's one of the new ones, would you then specify the accidents for the designer or would you specify the process?

MS. DROUIN: The process.

MEMBER CORRADINI: So this is not using the internal process to pick what you want to deterministically design to? Rather it's actually going to allow them to say "Well I have these ten." And you'd say, "Wait a minute. I don't like those ten. I have these nine plus two more." You see my concern.

MS. DROUIN: Right.

MEMBER APOSTOLAKIS: I suspect the applicant will have to demonstrate that they meet this curve.

MEMBER CORRADINI: Right.

MEMBER APOSTOLAKIS: Here is my design, these are the consequences.

MEMBER SHACK: And I picked these sequences by the process that's been outlined.

MEMBER APOSTOLAKIS: But, shall we move on?

MS. DROUIN: But recognizing because I do think to me one of the good things about the process, and what I said earlier, is that because they're going to have to maintain that PRA so that if the design changes, you know are they not doing things the way they said would be doing, you know they may now have to come in and new events may now show up.

MEMBER CORRADINI: I understand.

MS. DROUIN: That they would have to deal with.

MEMBER CORRADINI: I understand. Thank you, though.

MS. DROUIN: So it accommodates to me the uncertainty and the newness of these designs so it doesn't come in with this idea that here's your events for all time. These are it.

MEMBER APOSTOLAKIS: Now there is a major issue. What time is it?

MEMBER WALLIS: Before we move, are you going move on, George. I want to talk about the axis, the dose axis. You talked about the frequency thing.

MEMBER APOSTOLAKIS: I want to talk about the vertical axis.

MEMBER WALLIS: Could I talk about the dose axis for a moment?

MEMBER APOSTOLAKIS: I think you can. You're chairing.

MEMBER WALLIS: This dose you have in mind is at the site boundary, is that right? This is at the site boundary? Just yes or no.

MR. LEHNER: No.

CHAIRMAN KRESS: Microphone.

MEMBER WALLIS: John, microphone.

MR. LEHNER: Sorry. It's also a fixed axis in that up to a 100 rem it's the exclusionary of boundary. Beyond that it's one mile from the exclusionary boundary.

MEMBER WALLIS: One mile? This is some distance, right?

MR. LEHNER: Right.

MEMBER WALLIS: Okay. So I will design a reactor which fits in a cooling tower, all right. Fits in a cooling tower. If I have an accident, make sure it's damn energetic. I have some inflammable stuff in there. And if I have an accident, I light off an immense fire, and it's in a chimney, right. And it goes up as a plume. And it's so finely aerosol and it goes up and it lands a 100 miles away. I make damn sure that nothing lands a mile from my plant. All right. Is that an acceptable design?

MR. LEHNER: It is today.

MEMBER WALLIS: It is today. Well, that is not acceptable --

MEMBER MAYNARD: No, I don't believe that's true. I think you have to assume that the plume goes -- you have basically a --

MR. MUBAYI: This is Vinod Mubayi from

Brookhaven. Let me just comment on that.

If it lands a 100 miles away, the dilution factor will take care of the fact of meeting any such curve. Now, if it lands 1½ or 2 miles away, you might have some problems that you had up in licensing Seabrook where people on the beach in Massachusetts were just one and three-quarter mile away. There are those kinds of minor technicalities that apply to very individual sites. But, you know, but that would then be implemented with whatever you're going to site --

MEMBER WALLIS: Well, it's your reactor. If you tell me this it at some distance, I can try to design the plume that it's always going to go further than that distance.

CHAIRMAN KRESS: It's another reason to use curies --

MR. MUBAYI: Well, why would you design a plume to give a dose? You would rather not --

MEMBER WALLIS: To meet the regulations.

MR. LEHNER: But you also have to meet the safety goals.

MEMBER WALLIS: Yes, right.

MR. LEHNER: You know, a plume comes down 1½ miles away, you're not going to meet the safety goals.

MEMBER WALLIS: But you see my point. That just a dose at the site boundary is a pretty weak way of defining --

MEMBER MAYNARD: No, I don't believe that today's current requirements allow you to do that. I think you have to assume that they get to that.

MR. KING: The reg. guide requires you to assume a ground level plume.

MEMBER MAYNARD: Yes.

MR. KING: And in --

MEMBER WALLIS: Yes, but I designed it so it can't happen.

MR. KING: It would probably make sense, we'd do the same thing.

MEMBER APOSTOLAKIS: There is another issue here. The impression I get from reading the report is that what is called the frequency up there, which is implied to be the frequency of the dose, is really not the frequency of the dose. It's the frequency of events that do not meet the acceptance criteria, which is very different from the frequency of the dose.

MEMBER WALLIS: Very different. We made this point, too. It's a very funny curve.

MEMBER APOSTOLAKIS: So for the LBEs, it

seems to me, you have to do a complete analysis. Go all the way to the probability of exceeding the regulatory limits on temperature, pressure and so on. And then in the name of defense-in-depth, of course, you can impose margins and so on. But here these are not those frequencies. This is the frequency of having a dose between one and ten rem.

There is, in fact, a very small probability that given those frequencies, you will exceed the thing.

In other words, the frequencies are the traditional PRA frequencies that reflect only redundancy. They don't reflect the margin that you have. Because in traditional PRA the margin is given to us by Westinghouse, by General Electric. And the PRA guys look at the one out of two, two out of three, one of three and say, "Okay, I don't meet the acceptance criteria that Westinghouse has given." But that doesn't mean that even if you don't meet them all the time, you are lead to a major disaster. Because there is conservatism in those acceptance criteria.

So it seems to me the first evaluation of the LBEs should go all the way from the frequencies to the probability, given a certain context of exceeding the regulatory limit, which itself is conservative.

So even if you do that, you are still dealing with a conservatism, which I wouldn't touch. And then in applying defense-in-depth you might say "Now, look, I really don't like this probability of exceeding given these conditions." So independently in the name of defense-in-depth I want you to make sure it's such-and-such. And then the frequency will also be handled in a different way.

I mean these are real issues when you're trying to design a new system. Okay. These are not theoretical considerations. I mean for existing reactors we're all very pleased -- or happy, not pleased. Happy to accept what General Electric says or Westinghouse, or whatever. But for new reactors it seems to me it's an open field now.

CHAIRMAN KRESS: George, I don't understand. I can draw a curve there of perceived versus consequence. It's independent of the curve regulations. Independent of anything. This is just a policy statement.

Now, I say I want to use this curve as my guidance in selecting licensing basis events. I don't care -- and the way I'm going to do it is I'm going to also take a PRA and find out were sequences, too, in that curve.

MEMBER APOSTOLAKIS: Let me put it in a different way. You can do that, but the designer has a secret weapon now. The margins. So instead of imposing, you know, large margins that say for example you need two of the steam generators if you have those, he reduces that so you only need one. Immediately he has a dramatic impact on the frequencies. Because that part of the margins is not regulated yet.

CHAIRMAN KRESS: As long as he stays under the curve. And then --

MEMBER APOSTOLAKIS: No, but the curve is incomplete, that's what I'm saying.

MEMBER CORRADINI: I don't think I understand that part.

MEMBER APOSTOLAKIS: You're losing -- you have an accident sequence, right? It creates a certain conditions. Then the thermal hydraulics guys take over and they calculations. Whether the temperature, for example, or the cladding exceeds 2200 degrees, right? Now, that part is usually done independently of the PRA. It's done by the vendor. The vendor comes back and says "In order for this not to be exceeded, here are the acceptance criteria in terms of trains that must work and so on."

So the PRA, what we call PRA now is really only an evaluation of those trains working.

MEMBER CORRADINI: Yes.

MEMBER APOSTOLAKIS: Once you don't meet the acceptance criteria, you say core melt when in fact that's not true. Okay. And what I'm saying is in this kind of an evaluation if we keep that additional definition of frequency, that part that says -- you know, there is a buffer between what really happens in the PRA and it's called acceptance criteria. And I'm saying --

MEMBER WALLIS: So the lack of adequate thermal hydraulics in the PRA?

MEMBER APOSTOLAKIS: So what I'm saying is they do the frequency calculation and then you do the thermal hydraulic analysis for these selected LBEs. And then you have a clear picture of what is the frequency of exceeding whatever regulatory limits you have. And then you go to defense-in-depth and you say, "Yes, but I don't want to look at the whole sequence. I really want this part which I call margins to have this margin."

MEMBER WALLIS: George, I don't see why that you preserve this. And maybe you're arguing that you shouldn't preserve this dichotomy where you have

this analysis which has criteria and all that, and then you have the PRA. PRA is capable in principle of absorbing the thermal hydraulic --

MEMBER APOSTOLAKIS: That's what I'm arguing.

MEMBER WALLIS: That's what I argued, too.

MEMBER APOSTOLAKIS: Yes, it must be my accent.

MEMBER WALLIS: So we agree. We agree.

MEMBER APOSTOLAKIS: I thought I was arguing it very well.

MEMBER WALLIS: Thank you.

MEMBER APOSTOLAKIS: No?

MS. DROUIN: I don't agree quite with what you said because your statement was that the thermal hydraulics are done after the PRA.

MEMBER APOSTOLAKIS: Before. It's done before.

MS. DROUIN: I was going to say, because--

MEMBER APOSTOLAKIS: And it sets the acceptance criteria. And then the PRA tells you what is the frequency of not meeting these criteria.

MS. DROUIN: Well, I mean you have to come in first and, you know, and you define what your end state is. Now if we're talking LWRs, you know, where

you do it in the piecemeal of a Level 1, Level 2, Level 3 and, you know, you come in and what do you mean by the onset of core damage and what does that code calculate in trying to say this is what we mean by it. And there is a lot of argument out there of what is meant by that.

MEMBER APOSTOLAKIS: Exactly. And what I'm proposing avoids that. Because it goes straight to the regulatory limits that you impose. The figures of merits, temperatures, pressures, whatever, flow rates, and asks what is the frequency of exceeding that figure of merit without caring whether that's core melt or whatever. And this is very real for reactors. These people are not thinking that way.

MS. DROUIN: You got to -- you have to define your success criteria in the PRA or you don't have a PRA.

MEMBER APOSTOLAKIS: Exactly. In the current thinking you don't. And I'm saying that this should be a new thinking.

MEMBER WALLIS: I don't know why you need success criteria at all. You look at an accident, you look at its consequence. And PRA predicts the consequences.

MEMBER CORRADINI: Can I try it? I've

been listening. Can I try it.

MEMBER APOSTOLAKIS: Go ahead.

MEMBER CORRADINI: So what you're really saying is, Tom was saying that the X axis should not be dose, it should be curies. You're saying an intermediate step is the frequency and the X axis could be essentially temperature.

MEMBER APOSTOLAKIS: No, no, no.

MEMBER CORRADINI: I mean in some sense. Because you're saying --

MEMBER APOSTOLAKIS: Then you have too many curves.

MEMBER CORRADINI: No, I know.

MEMBER APOSTOLAKIS: Yes.

MEMBER CORRADINI: But I'm just trying to connect what Graham is saying relative to what you're saying. And in some sense there is a continual rain of successfully getting to some point or temperature-- so it could be temperature. And then eventually it rolls into -- it rolls up into curies released or dose with the site. But eventually it's all the steps along. That's what you guys are thinking --

MEMBER APOSTOLAKIS: No. I agree with Graham. It's just that we're expressing it a different way.

My point, my fundamental point is that this curve as it's presented implies the frequency of these rem is such-and-such, and I am saying it is not. Because there is this intermediate step which is very significant. This is the frequency of exceeding the acceptance criteria. That's not --

MEMBER WALLIS: With the present method, but if we do it right it can be the frequency.

MEMBER APOSTOLAKIS: Of course it can.

MEMBER WALLIS: Of course. Well, we're going to design it to be right.

MEMBER APOSTOLAKIS: Right. And then we go back, we look at the frequency of designing the name of defense-in-depth how much -- we may very well define new acceptance criteria. But that will be done after you have a big picture.

MR. KING: It sounds to me, George, like you're advocating the old way of doing business. The designer decides do I need two pumps, three pumps, so forth. And then he tests that design against this curve.

MEMBER APOSTOLAKIS: No. I'm arguing the other way.

MR. KING: Well, it didn't sound like it to me.

MEMBER APOSTOLAKIS: No. I don't want these acceptance criteria of two pumps. I want to go all the way to temperature.

CHAIRMAN KRESS: Fission product release.

MEMBER WALLIS: But not temperature alone. The consequences of the temperature in terms of fuel damage and so on and so on and so on.

MEMBER APOSTOLAKIS: Right. We have to agree on where to stop.

MEMBER WALLIS: Yes, right.

MEMBER APOSTOLAKIS: Because it's inevitable to have some conservatives in somewhere. And these, in my view, will have to be in the regulatory limits. Because, you know, the onset of damage is such a fuzzy thing. I mean so you say, like the 2200 degree Fahrenheit. I mean, we all know that if it's 2250, it's not the end of the world. Yet it's a regulatory limit we all live with it, we're happy, fine, instead of having a distribution. That's okay. That's too much.

MR. KING: So why would you want to go to temperature? Temperature doesn't have anything to do with consequences?

MEMBER APOSTOLAKIS: It's an intermediate.

MR. KING: It could, but it does not --

MEMBER CORRADINI: It's an intermediate measure.

MEMBER APOSTOLAKIS: Intermediate measure.

MEMBER CORRADINI: It's the same thing that I think Tom was saying relative to curies for the design versus dose at the site.

MEMBER APOSTOLAKIS: That's right.

MEMBER ABDEL-KHALIK: I mean wouldn't it be ideal if we have a graph where the horizontal axis is core failure probability?

MEMBER APOSTOLAKIS: Horizontal?

CHAIRMAN KRESS: I think you have to define that. And I would just as soon put it in terms of release of radioactive materials.

The one thing every reactor has in common is if they go through an accident, they're likely to release fission products. That ought to be the focus of any of our criteria, is the release. And you ought to be able to have a PRA that can tell you the frequency of giving accident sequences that end up with giving release quantities. If the PRA doesn't do that, it doesn't do much.

MS. DROUIN: No, I mean the PRA does that. I'm coming back to how -- you know, there's no problem with doing your PRA where your end state is your

releases.

CHAIRMAN KRESS: Yes. And I think you get away from core melt.

MS. DROUIN: You know, but whether or not you do something that's core melt, but my point is whatever you define as your end state, you know that end state is based on what is the success criteria to avoid that end state and then how do you define your accident progressions, your sequences, without success criteria.

CHAIRMAN KRESS: Well, I think the PRA does that.

MS. DROUIN: Well, it does. But I'm saying from the middle to that it's defining your success criteria. I don't know how you go about -- you don't know what your success criteria is.

MEMBER APOSTOLAKIS: I think your argument in the report is that if I take, for example, the range of between 1 and 10 rem, okay. I have all the frequencies, right, based on the criteria or the guidelines you are giving how to screen out and select and so on.

MR. KING: You have all the sequences that fall --

MEMBER APOSTOLAKIS: Yes. And then you are

saying the LBE will be the sequence or maybe a bunch of sequences whose consequences are the largest, that's how I understand it, in that interval. Which is fine.

Now the question is what is the frequency of that largest consequence? If it is curies, then I have to work backwards and I ask myself why do I have this release? Oh, because this thing melted. Well, what was the regulatory criteria, the limit for that? It was 2000 degree Fahrenheit. There was something else that failed because of high pressure. What was the regulatory limit? And then I ask myself what is the frequency of exceeding those limits?

MR. KING: Yes, but don't the PRA success criteria depend on those limits? I mean that's where those limits show up.

MEMBER APOSTOLAKIS: But the success criteria have additional conservatisms They are a -- of those limits.

MR. KING: They might, but they don't have to.

MEMBER APOSTOLAKIS: And we don't know much probability. What kind of probability level those success criteria represent. It's up to the vendor now.

And for water reactors of existing, maybe it's okay.

MR. KING: They look at each sequence and see do you exceed those success criteria.

MEMBER APOSTOLAKIS: But it seems to me that the staff should be interested in seeing this in a new design. Because in new designs you have a new ballgame. I mean you have to understand much more than -- well how we understand about LWRs.

There was somebody?

Look, all I'm saying is this should be explored. I'm not saying that what you're doing is wrong, but this is trying to get away from the way things are done now. Because you're entering a new era of new designs.

CHAIRMAN KRESS: I'm at a loss to know what your suggestion that they do, George, instead of this.

MEMBER APOSTOLAKIS: The frequency should include the margins, what they call margins. The margins now in the document are separate. Completely separately from the --

CHAIRMAN KRESS: How about if I just move the curve down, does that take care of it?

MEMBER APOSTOLAKIS: It would. But then

you would have to --

CHAIRMAN KRESS: The curve is arbitrary.

MEMBER APOSTOLAKIS: But you would have to do it in an intelligent way. You have to understand what is the probability given this sequence of exceeding the regulatory limit, which is the margin.

I mean, by saying I will remove it down by a factor of two, well you can do. But that's --

MEMBER WALLIS: Well, it's not really the regulatory limit. It's the probability of leading to consequences. This is your --

MEMBER APOSTOLAKIS: Yes. But most consequences are usually represented by a conservative regulatory --

MEMBER WALLIS: Which, you know, you can do that.

MEMBER APOSTOLAKIS: Otherwise you get into the --

MEMBER WALLIS: But if you don't do it conservatively, then you could propagate all the way through to the end.

MS. DROUIN: I guess I don't agree. I think if I understood what you were saying, George, that yes, right now we do a PRA. Embedded in the results of the PRA are margins. But to me that's a

good thing.

MEMBER APOSTOLAKIS: It's a conservative thing, sure.

MS. DROUIN: You know, even when you do your most realistic PRA you still have margin embedded in there. I would not propose that you do a PRA with the margins stripped away.

MEMBER APOSTOLAKIS: And I'm not saying that.

MS. DROUIN: Well, see, that's what I heard you were saying.

MEMBER APOSTOLAKIS: No. What I'm saying is make the margins part of the frequency calculation and then you decide how much margin you want to have.

MEMBER CORRADINI: Can I take an example of what I think you're saying?

Take your curve and I'll give a simple instance. The stair step, I still don't -- I understand where you got it, but I don't particularly -- so take ten to the minus 3 in dose and multiple it by one. So that's a ten to the minus three. Then draw a ten to the minus three line all the way down. Then take it down an order of magnitude, take ten to the minus one in frequency time ten to minus three and make that another line. Now you've got two diagonal

lines.

What he's saying is in essence that if you were to say I'm going to regulate off of that top line, buried in there is margin. Once you evaluate -- or margin in all these various acceptance criteria. Once you evaluate it you might find that the whole thing has essentially lowered.

MEMBER APOSTOLAKIS: Yes.

MEMBER CORRADINI: And then you then argue whether you want to be on the ten to the minus three line or the ten to the minus four line because now you evaluated all the behavior of the system. Is that what you're saying, I think?

MEMBER APOSTOLAKIS: Close.

MEMBER CORRADINI: Okay. I'm sorry.

MEMBER APOSTOLAKIS: In the new reactor designs it doesn't seem to me that the designers from what I have seen are going to put too much redundancy. They will have to rely a lot on the margin itself arguing that there is very large heat capacity, you know, the coolant will do its job and so on. In other words, what we call now Level II PRA, which -- well actually Level II is not even that. Level II is accident.

The setting of the acceptance criteria

that now is done by the vendor using various codes, that will play a much bigger role I think in these new designs. Because of their novelty. I mean, having three or four different loops to cool a reactor and you have helium circulating and all that requires a thermal hydraulic analysis. You can't just say I have a two out of four systems.

MEMBER MAYNARD: I'd offer a little bit differing opinion. I don't believe that we should be trying to quantify all the margin in the PRA. I believe it's important that we have margins segmented in various areas. Because that's how we deal with things that later we find such as that there was a construction deficiency or if there was an aging issue or something like that. You have operational margin and you have design margin, you have regulatory margin. And I think that it makes it much easier to deal with issues that come up where we've got those margins segregated out than trying to quantify all of it into a PRA.

MEMBER APOSTOLAKIS: But the document does require quantification. All I'm proposing is a different use. The document is very clear in several places that the margins should be quantified, right? You make that very clear. So I'm not asking for a new

thing there.

MEMBER WALLIS: Then you have to say what scale you're going to quantify them.

MEMBER APOSTOLAKIS: Oh, exactly. Yes. Yes. So we're not disagreeing on that.

MEMBER WALLIS: I wondered, Mr. Chairman, were we going to get through before lunch?

CHAIRMAN KRESS: No, by no means. We're going to take a break for lunch, supposedly starting now. We'll come back and continue this discussion after lunch.

MS. DROUIN: I'd like to make a proposal. You know, a lot of these issues that are being brought up, you know, they're excellent. But they get into the implementation and more of how we derive not just the licensing base events, but the ultimate requirements. And I think it might help if we spend a little bit of time talking about how all this comes together. Because ultimately, you know, we implement the full framework and not just identifying the licensing base events, but what this Part 53 would do. It's not just from this frequency consequence curve. And I think that's part of the problem here is that somehow there's almost -- I get the sense that we're making all these decisions based on this curve. And the

answer to that is no, we're not.

So I think it might help if we talked just a little bit about where all these other things come in to come up with the whole complete set of the requirements so you understand --

CHAIRMAN KRESS: Okay. Let's plan on doing that after lunch.

MS. DROUIN: Okay.

CHAIRMAN KRESS: And let's come back at 1:00. And I'm planning to recess until 1:00.

(Whereupon, at 12:03 p.m. the Committee adjourned, to reconvene this same day at 1:00 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:00 p.m.

CHAIRMAN KRESS: Whenever you're ready, Mary, I think we can start again. And did you want to do some more talking before we continue with the --

MS. DROUIN: I wanted to jump and do a little bit on Chapter 8.

CHAIRMAN KRESS: I thought you might, yes.

MS. DROUIN: You know, because I think it may help.

DESIGNATED FEDERAL OFFICIAL FISCHER: You need to use that mike, Mary.

MS. DROUIN: Yes.

CHAIRMAN KRESS: I think we'll be off the record until they're ready to go.

(Whereupon, at 1:02 p.m. off the record until 1:04 p.m.

MS. DROUIN: For those who have a copy of the document in front of them, I'm on page 8-2.

And what this diagram here shows is how do we take all the different pieces that are in the framework document and when we turn the crank and generate all the technology-neutral or specific, the identification of this set of requirements that are already codified in Part 53 or some other way, how do

we get there. And the sense I was getting this morning there was kind of an impression that it's just halfway from the consequence curve. And that's not true.

I mentioned in passing that we have the protective strategies. And the protective strategies, we have five of them starting with, you know -- maybe I should pull those up.

MEMBER APOSTOLAKIS: Initiating event, barriers --

MS. DROUIN: Correct.

MEMBER APOSTOLAKIS: Yes. We know.

MS. DROUIN: And the protective strategies were meant to look at going from an event that could challenge the plant to ultimately having a release. And so if you had these protective strategies in place, they were to hopefully, you know, prevent those things from occurring so that you didn't have an event given you had an event, you have those systems in place to mitigate that event. Given those systems failed, do you have some kind of barrier to contain it. And given that you don't have -- you know, the barrier fails, do you have some way to control the consequences. So those were the protective strategies.

Then we came in and said okay, we want to write requirements for each of those.

MEMBER WALLIS: While you do that, this is performance based. The strategies are a way of meeting performance, right? The only thing that that is is the measure of performance?

MS. DROUIN: The strategies -- no. Strategies are identified where we want requirements.

MEMBER WALLIS: But that's saying how they have to meet the performance, right?

MS. DROUIN: No.

MEMBER WALLIS: By having all these strategies?

MS. DROUIN: Bear with me, that's not. The strategies are just identifying what we want requirements for.

MEMBER WALLIS: Yes. So you're going to micromanage how they meet performance?

MS. DROUIN: No, we're not. Bear with me, please.

MR. KING: Then it's high level defense-in-depth, you know lines of defense. And from there the requirements are derived. But they're just a high level way to breakout the various defense-in-depth type categories.

MS. DROUIN: It goes back that cartoon viewgraph I had where you have this idea and you want to start writing requirements. How do you know what kind of requirements you need. And how do you know you're complete. So all we're saying is that at a high level we want requirements that would fulfill these strategies. It's not how you're going to meet them. We just want requirements there.

So let me not come to that figure. Let me go to -- so then what we have said for each of those strategies we're going to kind of do a logic diagram that looks very similar to a fault tree. Because a fault tree is a deductive analysis. So we want to apply this deductive logic to break it down to identify what are those things or topics, we call them topics in the report, that could challenge that protective strategy.

Again, we're not telling you how to meet it. It's what are those things that could challenge it or preclude that protective strategy from being successful. So we're trying to identify the challenges. And then based on those challenges, then what requirements would you want in place?

MEMBER WALLIS: And all this has nothing to do with the PRA?

MS. DROUIN: So far it has nothing to do with the PRA.

MEMBER WALLIS: This is a whole lot of extra stuff --

MS. DROUIN: This is the process of how we would go about in identifying the requirements. And so just not a bunch of people to be a little bit sarcastic, sitting around a table and doing a lot of good brainstorming. We're trying to put some structure to it and some logic of what are those requirements we need. Not exactly what that requirement will be in terms of how you write it. But just what we need requirements for.

So they're not falling out of this consequence curve. They're falling out coming through with each one of these protective strategies, you know doing this logic, deductive reasoning --

MEMBER WALLIS: But doesn't all this go into the PRA, this functional failure of protective strategy leads to some consequence? Isn't that the whole idea of the PRA?

MR. KING: The PRA is a way to implement what comes out of here.

MEMBER WALLIS: But then why are you micromanaging how they do it?

MS. DROUIN: This is not saying how they're going to do it. This is an identification process.

MEMBER APOSTOLAKIS: They are saying that in addition to everything else, the staff would not want to see too many initiators. The staff cares about the integrity of the barriers even though these are embedded are in a PRA, the barriers themselves are of interest to us. You have to make sure that --

MEMBER WALLIS: So it's not performance based anymore. It's virtual based?

MEMBER APOSTOLAKIS: No, this is defense-in-depth. This is defense-in-depth.

MEMBER WALLIS: This is what you go through to satisfy the staff rather than the performance, right?

MEMBER APOSTOLAKIS: Performance comes after you build that.

MR. KING: Some of the things that come out of here are going to be performance related.

MEMBER BONACA: For example, the requirements for stable operations seems to be a reasonable expectation which you have.

MR. KING: Yes. Yes.

MEMBER BONACA: And then protective

systems you will expect that will have protective systems?

MS. DROUIN: But this is a way of identifying your requirements. Once you identify what that requirement is -- and when I say "is," then you would determine, okay, now how should I actually write that requirement. And I would want to write it in a performance manner.

Now just identify that I need a requirement to -- there's no reason for me suggesting this one, but I need a requirement to control gas. You know, gas control. Now, what that requirement would actually be, I would like to write that in a performance-based manner. But how do I go about identifying that I need a requirement for gas control? You know, how do I need -- you know, when you look at Part 50, how do I come up with what I write? You know, identifying what I need? And so that's where we put this structure was to say, okay, we go back to we want to ensure the public health and safety. In ensuring the public health and safety, we want to make sure that we're controlling events, we're putting protective systems in place. You know, we want barriers. And what are those things then that could challenge those? And then so we want requirements

there to impose on the design so that the design to the optimum possible that these things don't occur.

Let me open up the Appendix. Is it Appendix G or H?

MEMBER APOSTOLAKIS: So you are essentially anticipating the oversight process later?

MS. DROUIN: And in some, you know --

MEMBER APOSTOLAKIS: Yes, in a sense that's what you're doing.

MS. DROUIN: -- you're making a nice one-to-one mapping. I was going to try and show you an example of one of the fault trees. These are the outputs from the tree. Okay, here's one.

Functional failure barrier integrity. That's the fourth protective strategy. So it just walks down through and looks at how can this not -- I mean, what could challenge this to happen -- to not happen. Sorry.

MEMBER WALLIS: Well, aren't these all just things you'd put into your PRA and you got to evaluate all these things.

MS. DROUIN: Okay. This is nothing to do with the PRA right now. This is independent of the PRA. This is saying, okay, I want a protective strategy that, you know, barrier of integrity on these

barriers and would could challenge the function of barrier integrity. And so it just starts walking down through it and identifying.

And then all of these things coming out are possible challenges that could preclude -- could challenge your barriers.

MEMBER APOSTOLAKIS: Mary, would you say that this a form of Appendix B requirements, quality assurance?

MS. DROUIN: No. This is simply identifying--

MEMBER APOSTOLAKIS: Well, that's what this is. It says, you know, make sure that you use good quality materials, make sure this and this and this.

MS. DROUIN: No, no. That's a requirement. That would fall out from this.

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: So this is coming in. And like right here on this one it says BI-1. So this is the barrier integrity topic one. And you see here it says "How should adequate barrier design" -- I need glasses -- "design integrity and reliability be assured."

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: Okay. Now --

MEMBER WALLIS: You are telling them how to do it. You're not saying we have a criterion for adequate design. You're --

MEMBER APOSTOLAKIS: I guess Graham is saying that you all you need is the first column. Express your concern and let them figure out how to do it.

MEMBER WALLIS: Let them figure out how to do it.

MEMBER APOSTOLAKIS: That's what you're saying.

MEMBER WALLIS: Right.

MEMBER APOSTOLAKIS: Instead of having the second column that says design barriers must be consistent with such and such and such. How should I--

MS. DROUIN: Well, how should adequate barrier design and reliability be ensured, we're just taking it a step further.

MEMBER APOSTOLAKIS: I understand. But he's objecting to it.

MEMBER WALLIS: If you define the reliability that you want, we'll design it to meet your specifications. You don't need to be told how to

design it.

MEMBER APOSTOLAKIS: Could be.

MS. DROUIN: We're not telling them how to design it when you read what's here. This would be translated into a requirement that would be, to the extent that it's appropriate and an ability to do it, would be performance-based. So you go to Appendix -- I don't remember what appendix it is that gives the guidelines for how you would take -- we've said, okay, we want a requirement that deals with this. So this is not the requirement here. This is still an identification as we want a requirement in design that deals with how should adequate barrier design, integrity and reliability be assured.

MEMBER WALLIS: What's your criterion for knowing it's good enough?

MS. DROUIN: That's a different question. All I'm trying to do here --

MEMBER WALLIS: Well, I can wrap it in a tin foil or something and say that's good enough, I've put a barrier there. Unless you've got some kind of an evaluation on it.

MR. KING: You're going to just go back to that frequency consequence curve --

MEMBER WALLIS: Yes, okay. So that's --

MR. KING: And where those advance up through ten to the minus fifth --

MEMBER WALLIS: Right. Let's derive it from that, not try to make --

MR. KING: However, it has to be maintain its integrity such that you don't exceed the FC curve.

MEMBER WALLIS: Yes. Yes.

MS. DROUIN: The frequency consequence curve is helping you how to write the requirement. The frequency consequence did not identify the need for this requirement. That's what I'm trying to say differently here. And it seemed to me that people were thinking that you use the frequency consequence curve to identify what requirements you need. It's not. That's helping me how to write it.

MEMBER APOSTOLAKIS: But I think the real disagreement is that we don't need the second column to tell people what to do. Once you say that you want to have adequate barrier designs so their liability is assured, the framework should leave it at that. And then maybe regulatory guides or something else will come in and say --

MEMBER WALLIS: These are acceptable ways to do it.

MEMBER APOSTOLAKIS: Yes.

MEMBER WALLIS: That's right.

MEMBER APOSTOLAKIS: It's not a big deal, but you know it's a good point.

MR. LEHNER: Yes. Actually we've gone a little bit beyond that in that we have put some deterministic requirements on the barriers, for instance, in certain frequency ranges. If you could look at our chapter 6, it said that in the frequent range, which is ten to the minus two or greater, you should have no barrier failure. In the infrequent range you should have at least one barrier remaining. So these are things beyond the PRA that are in there for defense-in-depth purposes.

MEMBER APOSTOLAKIS: But if you have a frequency ten to the minus two of what? Of a certain dose, right?

MR. LEHNER: Yes.

MEMBER APOSTOLAKIS: What does it mean to require a barrier? And the dose, presumably, is very, very low at such a high frequency. So to say that one barrier remains intact, can that barrier deal with what? With the release of radioactivity.

MR. KING: Because we're trying to meet the frequency consequence curve. This is --

MEMBER APOSTOLAKIS: We already met it.

But now you are saying no, in addition to that I want a --

MR. KING: And that's a defense-in-depth provision.

MR. LEHNER: Yes, you could meet the frequency consequence curve by having, you know, very -- in theory you could meet it by showing that your initiators are so low that you could grab your -- use two fold for your system and still meet the frequency consequence curve because I'm never going to get to a--

MEMBER APOSTOLAKIS: But the ten to the minus two is the frequency of that dose. It's not the initiating event frequency.

MR. KING: Well, it's initiating event frequency on the FC curve the way we present it. And then for all events that are in that frequency range, they have to meet that dose requirement.

MEMBER WALLIS: They must have consequences.

MEMBER APOSTOLAKIS: The FC curve, the frequency is the frequency of the initiator? Not the sequence.

MR. KING: No. The sequence. The sequence.

MEMBER APOSTOLAKIS: The sequence?

MR. KING: Yes, it's the sequence.

MEMBER APOSTOLAKIS: So that's what I'm saying. That you have the dose and there is a ten to the minus two. Okay. That ten to the minus two is the frequency of leading to that dose.

MR. KING: All the sequences that are ten to the minus two or greater have to meet that dose.

MEMBER APOSTOLAKIS: Right. Right. So what's the point of saying I want an additional barrier?

MR. KING: Defense-in-depth. There are some defense-in-depth in here.

MS. DROUIN: And that was the part, if I go back over here --

MEMBER APOSTOLAKIS: I mean how does that work? I mean this is the frequency of something failing and leading to that doors.

MR. KING: Defense-in-depth is --

MEMBER APOSTOLAKIS: Now if you put an extra barrier, you're changing the frequency.

MEMBER WALLIS: Right. Yes. So no one can have a failure denying that there's any frequency of anything.

MEMBER APOSTOLAKIS: Then you are pushing

the frequency down.

MEMBER WALLIS: To zero.

MR. KING: But we are not saying it can never fail. We're saying, like the things Dana mentioned aging and so forth that are accounted for in the PRA, defense-in-depth measures are put in there to try and take care of those things.

MEMBER APOSTOLAKIS: No. But I'm trying to understand the curve again. Between one and 10 rem the frequency limit is ten to the minus three. Now you say no, but I also want an extra barrier. The existence of that barrier is already folded into the ten to the minus three. If you put another barrier, then it's not ten to the minus three anymore. It's something else.

MEMBER ABDEL-KHALIK: That's a different sequence.

MEMBER APOSTOLAKIS: Yes. You are changing the sequence.

MEMBER ABDEL-KHALIK: Right. Different event.

MR. LEHNER: It's not already folded in, because like I said in theory you could meet it with just having very -- you know, no initiating frequency.

MEMBER APOSTOLAKIS: You know,

conceptually I'm trying to understand. I'm not saying you're wrong. I'm just trying to understand what that means.

You have a ten to the minus two, but then you want an extra barrier. And my point is that the ten to the minus two includes the existence of these barrier.

MEMBER CORRADINI: But it doesn't include the performance of the barrier, and you're giving an internal performance --

MEMBER APOSTOLAKIS: Well, no. It should.

MEMBER CORRADINI: I guess what's bothering me is, I mean what you're saying I think is correct.

MEMBER APOSTOLAKIS: Yes.

MEMBER CORRADINI: But I -- but if you do it this way, I could generate a design that would not need containment. Would we be comfortable with that? I mean --

MEMBER WALLIS: No. You have a separate difference in depth requirement. I mean it says you must have --

MEMBER CORRADINI: But that's what they're essentially doing here. That's essentially what they're doing.

MR. LEHNER: Yes. We are saying you want a minimum of two barriers when you go in --

MR. KING: We're not saying you need an extra barrier. We're saying if you -- yes. If you met the ten to the minus two because of a barrier, that's fine. We're not saying you need one in addition to that.

MEMBER APOSTOLAKIS: Okay. So what you're saying is that the frequency -- the sequence that leads to this rem should not consistent of one event. The ten to the minus two should not be the failure or occurrence of a single thing. It should be the combination of something.

MR. MRORCA: This is Bruce Mrorca.

An example would be if you had a ten to the minus two sequence and the requirement for defense-in-depth is zero barrier failures, so you have all barriers intact. So if you have a steam generator 2 rupture sequence that's greater than ten to the minus two, and let's say that sequence met the frequency consequence curve, however it essentially has barrier failures, it would not meet the defense-in-depth criteria. So that sequence would not meet the acceptance criteria and would have to be modified such that it would have zero barrier failures or it

would have to be reduced in frequency where it's allowed to have a barrier failure.

So embedded in the sequence is both the frequency to sequence includes whatever equipment is required for that sequence to mitigate that sequence. But in this case we put additional defense-in-depth criteria, deterministic criteria in addition to the frequency calculation.

MR. KING: Look at it this way, George. We're saying up front for defense-in-depth purposes a minimum of two barriers. Now when you start looking at the accident sequences that occur for the ones that are more likely, we want small consequences. That's what the frequency consequence curve says.

We also deterministically say for those things that are likely to happen, we don't want either of those barriers to fail.

MEMBER APOSTOLAKIS: Well, that's what bothers me. Because there's always a probability of a failure of a barrier. You can't say you don't want them to fail. They're in the PRA, as George points out. You've got to say it's a sequence, must have at least two barriers for which the frequency of failure of evaluated.

MEMBER WALLIS: That's different, and I

think that's what you mean.

MR. KING: That's what we mean.

MEMBER APOSTOLAKIS: That's you mean.

MR. KING: The frequency would be lower than ten to the minus two or whatever.

MEMBER WALLIS: When you say a barrier will not fail, that's an allusion.

MEMBER APOSTOLAKIS: Yes, the frequency --

MR. KING: You're more precise in saying it.

MEMBER APOSTOLAKIS: The frequency you're calculating, I think the requirement should be in certain -- you don't impose that on all of them, right? It's only for the high frequencies.

MR. KING: Right.

MEMBER APOSTOLAKIS: That should be the result of two or more failures. In other words, you shouldn't rely only on the fact that you may not have a small LOCA, because you could design your pipes to be very reliable.

MR. KING: The reliability has to be --

MEMBER APOSTOLAKIS: Right. It has to be plus something else.

MR. KING: Yes.

MEMBER APOSTOLAKIS: So you're sort of

sneaking into it a single failure criteria?

MR. KING: Yes. Exactly.

MEMBER WALLIS: Now wait a minute. You're requiring more defense-in-depth for the events with small consequences.

MEMBER APOSTOLAKIS: Right. Yes.

MEMBER WALLIS: It doesn't make any sense. It's got to be the other way around. It doesn't make any sense at all.

MR. KING: You don't want likely events to lead to very large consequences.

MEMBER APOSTOLAKIS: No. You want defense-in-depth against the big events which are harder to predict. You don't need a lot of defense-in-depth against things which happen every day and which you can mitigate. You need defense-in-depth for the big events which you can't predict very well. All the ones which you think you've forgotten or something. That's where you need defense-in-depth.

MR. KING: Well, this includes defense-in-depth for those, too. But we're saying we start out with the LOCA events --

MEMBER APOSTOLAKIS: Because the other ones, the ones that happen everyday, you've got to get a lot of experience with you've got to learn how to

handle them.

MR. KING: Yes, but look at this way, those things you know are going to happen, you want to be sure with high reliability that the off site dose is really small.

MEMBER APOSTOLAKIS: But it is already small.

MR. KING: Not necessarily.

MEMBER APOSTOLAKIS: Well, then you shouldn't have a higher likely one that has a big dose.

MR. KING: Well, as you go on down in frequency, lower frequency the doses go up. But you recognize that those are more severe events and the requirements then instead of saying two barriers should remain intact, it's down to one barrier.

MEMBER APOSTOLAKIS: You don't need a containment for the small events, the small dose that's site bounded, which might everyday. You need the containment for the big thing that's hard to predict that you're not quite sure about. That's why you need the containment.

MS. DROUIN: But we have defense-in-depth because of our uncertainties, short and simple.

MR. KING: But the big thing is going to

likely damage the other barriers --

MEMBER APOSTOLAKIS: That's why you need the containment.

MR. KING: Yes, exactly. And this gets to that.

MEMBER APOSTOLAKIS: No. Because if the additional barrier fails, you're in a different sequence and different consequences.

MR. KING: Exactly. The consequence goes up.

CHAIRMAN KRESS: Right.

MEMBER APOSTOLAKIS: Protection not against the range we're talking about. It's protection from the thing evolving to something worse.

MR. KING: Yes. And you don't want the little things to damage the barriers that you kind of have there for the big events.

MEMBER BONACA: I mean most of the act of protection system functions are really keyed on making certain events, very frequent, okay, have no consequences.

MEMBER APOSTOLAKIS: Right. The way I understand it is that this unnecessary because it's already covered by the other requirements you have for higher consequences. Because you are reducing the

frequency, necessarily then for the sequence of ten to the minus two that leads to this dose to become something that leads to a higher dose requires additional failures. So already some barrier is intact. Otherwise it would be in a different event.

MR. LEHNER: I think in practice that's true. I mean all we're saying is that, as I said before, theoretically you could say, you know, I don't need any barriers because my initiating events are so low that I can meet this curve with no barriers. That's what this is trying to prevent. That kind of a--

MEMBER ABDEL-KHALIK: I look at this as just another constraint where you're plotting the minimum number of intact barriers against frequency. So you have an FC curve which allows you to identify various sequences of high probability in the various consequence range, but you also have another constraint. The minimum number of intact barriers that you need to have in each frequency range.

MR. KING: That's the defense-in-depth.

MEMBER WALLIS: That's not defense-in-depth. As George points out, in order to get the consequences very low you need lots of barriers. Okay. That's in the PRA.

MEMBER APOSTOLAKIS: It's already dealt with.

MEMBER WALLIS: You need defense-in-depth for the other end, the unlikely event. And he just said that. I think you just said you need it for the unlikely event.

CHAIRMAN KRESS: It's not necessarily true that you need all those barriers to get frequency of those back consequences now. You could very well show for a PBMR -- gas cooled reactor.

MEMBER APOSTOLAKIS: You show what?

CHAIRMAN KRESS: But you may want to get a barrier there anyway.

MEMBER WALLIS: Because of uncertainty about a possible --

CHAIRMAN KRESS: Uncertainty.

MS. DROUIN: You have a defense-in-depth for those things that are not in the PRA and they aren't in the PRA because either you don't know about them, which is the biggest one --

MEMBER APOSTOLAKIS: No.

MS. DROUIN: You don't know. These are the unknown unknowns. I get those words confused. But anyway, it's the things that we don't know are the things we think we know about and are completely --

MEMBER APOSTOLAKIS: We only have a containment for things which are not in the PRA?

MR. KING: It's to take care of uncertainties.

MEMBER APOSTOLAKIS: Are you serious?

MS. DROUIN: I'm sorry?

MEMBER APOSTOLAKIS: You only have a containment for a light water reactor because of the things that aren't in the PRA?

MS. DROUIN: No. I said we have defense-in-depth because of uncertainties.

MEMBER APOSTOLAKIS: Well, containment is the ultimate defense-in-depth.

Why do you have a containment? I mean if you look at the AP-1000 you could conclude it doesn't need a containment because the core damage frequency is so low that the value of the containment is a few hundred bucks a year.

MS. DROUIN: That's right.

MEMBER APOSTOLAKIS: But you put it on anyway.

MS. DROUIN: You put it on anyway because--

MEMBER APOSTOLAKIS: Why? Because of the possible large events which you haven't foreseen and

which might be the containment --

MS. DROUIN: That's what I just said.

MR. KING: And this doesn't rule --

MEMBER APOSTOLAKIS: You said you put it on for the minuscule ones that happen everyday.

MS. DROUIN: No, no. I just said -- I don't know. What I just said was we have it there because of uncertainties. The things that we don't know about.

MEMBER APOSTOLAKIS: And not about the minuscule events that aren't the big ones.

MS. DROUIN: We have not been able to model them.

MR. KING: Yes, the big events. But it's also there to help you on the minuscule ones. I mean, it's there.

MEMBER APOSTOLAKIS: But not to have to prevent the things which you think are going to happen very often. It's there to prevent the things which might happen but you haven't thought of, but you don't think they're going to happen very frequently.

MR. KING: Yes.

MEMBER APOSTOLAKIS: But it's there for the low --

MEMBER BONACA: Did someone claim that

these extra barriers of containment, it's always there?

MS. DROUIN: I mean we can quibble -- let me finish answering --

MR. KING: I have a requirement for what we call a containment functional performance. Depending on the technology, you know it's not always going to be a large dry containment. But there is a containment functional performance requirement.

MS. DROUIN: I want to get back to Graham. I mean, because we are in agreement.

MEMBER WALLIS: Good.

MS. DROUIN: Some of it may not being expressed well here, but we have defense-in-depth because of uncertainties, because of the things we don't know about. And how do we handle, you know we may think that the risk is so very low on some of these reactors, but that's based on our knowledge; what we think we know. And there might be some things out there we don't know that could drastically change that risk. And so that's why we have defense-in-depth.

If we were absolutely positive of our knowledge and we were able to quantify and model everything, then you wouldn't need defense-in-depth.

But we don't know everything and some of the things we do know, we don't them accurately. So we want defense-in-depth in there for that.

MEMBER APOSTOLAKIS: Absolutely correct. So this is the general statement of why we want defense-in-depth. I think the question here was very specific.

MS. DROUIN: Well, I understand that. But I disagree that you think that you think it's a general statement. I can't tell you how many arguments we've had with people for just that fundamental why you have defense-in-depth there.

MEMBER APOSTOLAKIS: But this Committee is with you on that. We are all structuralists.

MS. DROUIN: Now once you get past that, then how do you implement it and how do you define it?

DESIGNATED FEDERAL OFFICIAL FISCHER: Mary, I think Graham's concern is when you look at the framework in section 6 where they talk about additional deterministic criteria, it applies additional deterministic criteria a lot to events with high frequency, you know more frequent than ten to the minus two -- between ten to the minus two and ten to the minus five there's a little less additional deterministic criteria. And when you get below ten to

the minus fifth there's no additional deterministic.

MEMBER APOSTOLAKIS: That's one point.

DESIGNATED FEDERAL OFFICIAL FISCHER: Okay. And I think he's making that point. It's counter-intuitive to him the way you went somewhat backwards in applying less and less.

MS. DROUIN: I need to go back and look and see how that was written. Because I can tell you the way we developed the defense-in-depth, the way we defined it, the way we have defined the principles and the way we have implemented it has not been based on that.

MEMBER BONACA: I mean it seems to me these barriers or conditions are put there so that events do not propagate to a less frequent but more severe event. So you're putting a lot of provisions. And I would suspect the same sequence will appear in different frequency categories depending on the many factors you're assuming.

MEMBER APOSTOLAKIS: But the point, Mario, is that the reason why it's ten to the minus two and not ten to the minus three is because some barrier is intact; that's the point.

MEMBER BONACA: That is true.

MEMBER APOSTOLAKIS: You don't have to say

that again. However, you can say -- invoke defense-in-depth and say for example that the ten to the minus two should not come primarily from administrative measures. Because remember the six items of defense-in-depth in the regulatory guide. Over reliance on -- what is it -- administrative -- dramatic things should be avoided. That I understand. Because that addresses the issue of ten to the minus two, where did it come from. But to say that one extra barrier has to be -- yes, there will be. Because if it fails, then you're in a different sequence, different consequences. So that specific guide talks about a barrier is unnecessary. But the other stuff about defense-in-depth is very valuable.

MR. KING: And Mario expressed it very well. You don't want likely events to propagate into severe events. That's why you have more things that you require for the likely events. Eventually you're going to get to a point where low probability events are going to wipe everything out.

MEMBER APOSTOLAKIS: Sure. Yes.

MEMBER WALLIS: So you have a containment on existing reactors in order to protect yourself against the high probabilities of AOO type things?

MR. KING: No. You have requirements on

maintaining fuel integrity, you have requirements on maintaining coolant boundary integrity. And then you have containment.

MEMBER BONACA: By the way, the figure you have, figure 65 -- well illustrates this point.

MEMBER APOSTOLAKIS: Can we see that? Page what?

MEMBER BONACA: It's six dash four.

MS. DROUIN: But before we go there, somehow there's an impression that it's just not accurate. And if you go here to table 8-2 this how the defense-in-depth is implemented in terms of what requirements are needed for defense-in-depth. And for each of the principles, which are coming down here and we identified six defense-in-depth principles. And across the top here you have the protective strategies.

What kind of defense-in-depth we needed was independent of that curve. Here's what we're saying is that when you go in and we're identifying what we need for physical protection or stable operation for this principle this is what, you know, you need to be doing to meet defense-in-depth. And--

MEMBER WALLIS: What does integral design process mean? That's what I think I'm saying, is that

the designer takes account of all of this stuff. Isn't that what that means at the top there?

MR. KING: Not necessarily. That means in the past the design has been done and then security has been sort of an overlay on it. This is suggesting that to be done hand-in-hand.

MEMBER WALLIS: Well, it should.

MR. KING: Which is something additional than what's required today.

MEMBER WALLIS: Yes, we agree with that.

MR. KING: We're saying that we're requiring that because of defense-in-depth, so that you better integrate the things is defense-in-depth is what we're saying here. You may not agree with that, but that's what we're saying.

MEMBER WALLIS: What's this provide containment functional capability? That only appears in that box. Why is it over there?

MEMBER APOSTOLAKIS: Where is that?

MR. KING: It's under barrier integrity. Protective strategy for barrier integrity. And that's where we get to containment.

MS. DROUIN: Right. So I mean the principle is right here. Account for uncertainties in performance and provide safety margins.

MEMBER APOSTOLAKIS: This is fine under barrier.

MS. DROUIN: And then when you look at -- when you come back up here to --

MEMBER WALLIS: Well, how do you decide when a containment is necessary?

MEMBER APOSTOLAKIS: We're always saying we want containment functional capability. Exactly what that has to be will be different depending on the technology you're looking at. But there are some words in the framework that tells you what the performance of that has to be.

MEMBER WALLIS: You're going to get in real trouble with me when you start talking about safety margin. Because I don't know what it is. It's talked about everybody. I don't know what it is because it's never been defined.

MS. DROUIN: Well, we did take a cut at defining it in the framework.

MEMBER APOSTOLAKIS: Conceptually you take a cut at it. But there is a limit, a limit, a limit. You don't go the extra step and say there will be some uncertainty on the assessment and then the probability of exceeding --

MEMBER WALLIS: You list all the sequences

and stuff and you put in all the uncertainties and you show there's a certain probability of exceeding something. Then I think I begin to understand what you mean by safety margin.

MR. KING: That's the idea. It talks about safety margin and regulatory limits. Take the 2200 degrees --

MEMBER WALLIS: But I don't understand how -- yes, but --

MR. KING: There's some distribution as to at what temperature --

MEMBER WALLIS: Presumably the 2200 degrees is there because it's the 95th percentile of something or other --

MR. KING: Yes, exactly.

MEMBER WALLIS: -- and the mean is under 2500 and so on.

MR. KING: Exactly. That's this concept.

MEMBER WALLIS: If you quantify the probabilities, then you're telling me something about what you mean by safety margin.

MEMBER APOSTOLAKIS: And they ask for that. They do ask for the quantification.

MR. KING: Slide 27.

MEMBER WALLIS: But I don't know what a

containment does for safety margin. I think it's something laid on by decree.

MR. KING: Those are two different things and we didn't --

MS. DROUIN: And we don't require, as you can see for defense-in-depth, an actual containment. We ask for a functional capability.

MR. KING: We don't ask for a traditional containment.

MS. DROUIN: That's right.

MR. KING: IT could be different. But it has to perform the same function. It has to retain fission products for these very unlikely events.

MEMBER WALLIS: Very unlikely events, huh? Good. Thank you. We're getting there.

MEMBER APOSTOLAKIS: Move up a little bit.

MS. DROUIN: Go up?

MEMBER APOSTOLAKIS: Just a little.

MEMBER APOSTOLAKIS: Okay. So not depend number 3. That is that? What's the heading of that column?

MS. DROUIN: That's the defense-in-depth principle.

MEMBER APOSTOLAKIS: Could you go up so we could see it?

MS. DROUIN: Here, this is the defense-in-depth principle.

MEMBER APOSTOLAKIS: And this is now for frequency. Let's look at the top case, stable operation.

MR. LEHNER: Those are the protective strategies.

MS. DROUIN: These are the protective strategies.

MEMBER APOSTOLAKIS: So provide at least two barriers. For what?

MEMBER WALLIS: Fission product release, presumably.

MR. KING: Yes. For defense-in-depth purposes. This table is defense-in-depth measures that have been put in.

MEMBER APOSTOLAKIS: And this is considering the dose?

MR. KING: Yes. Well, the idea is that it reduces the dose.

MEMBER APOSTOLAKIS: Yes. But I mean when you say two barriers, I have to demonstrate I have two barriers between an initiator and the ultimate dose.

MR. KING: Right.

MEMBER WALLIS: So having the cladding and

the reactor vessel is two barriers, or the reactor coolant system?

MR. KING: Yes.

MEMBER WALLIS: You don't need a containment, right? You got a cladding --

MR. KING: And you get to that next one down on number 5 it says --

MEMBER WALLIS: But suppose your accident is the loss of one of the barriers? Then you've only got one left?

MR. KING: Still have containment. We've separated out the --

MEMBER WALLIS: Well you've got two barriers. Then you got another barrier. But --

MR. KING: Put containment aside, we want two barriers. Containment is brought in as a separate item.

MEMBER WALLIS: Okay. Well, there's two barriers besides the containment?

MR. KING: Right.

MEMBER APOSTOLAKIS: But these requirements are not frequency independent. Because for some of the rare events you don't have two barriers. You have failed just about every thing.

MR. KING: That's what Mary was reading

from that table that said, hey, for the frequent events you want both of those barriers to remain intact--

MEMBER APOSTOLAKIS: And frequent is defined?

MR. KING: For the infrequent you can lose one and for the really rare ones you can lose them both, but you still have the containment to back that up.

MEMBER APOSTOLAKIS: Okay. Okay. And my point --

MEMBER CORRADINI: That's what's worrying me now.

MEMBER APOSTOLAKIS: And my point is that the fact that they're already frequent means that you have at least barriers.

MR. MUBAYI: That is correct.

MEMBER APOSTOLAKIS: Kind of superfluous.

MR. MUBAYI: I think that is the right thing, too. And that is the interpretation meant in the framework that you have those barriers intact and they keep you within that frequency range.

MEMBER APOSTOLAKIS: You don't have to say it here.

MS. DROUIN: But you're not doing this

because of the frequency.

MEMBER APOSTOLAKIS: Right.

MS. DROUIN: This is independent of the frequency. You have to have it. You have to have two independent, redundant diverse means for reactor shutdown and decay heat removal.

MR. KING: The frequency comes in, Mary, where they can start to fail. And they can only start to fail when you get into the less frequent events.

MS. DROUIN: Well, I understand that.

MR. KING: So it does bring it in and it matters.

MEMBER APOSTOLAKIS: It is there?

MS. DROUIN: Yes, but you're not imposing this because of something that came out of that. You're imposing this because of the defense-in-depth principle

MEMBER APOSTOLAKIS: But if I take this literally and I go to the ten to the minus five sequences, I -- I have to impose two additional barriers?

CHAIRMAN KRESS: You start out with two.

MS. DROUIN: You start out with two as a minimum.

CHAIRMAN KRESS: These are the --

MEMBER APOSTOLAKIS: In general, two barriers?

CHAIRMAN KRESS: -- design criteria.

MEMBER APOSTOLAKIS: Oh.

MS. DROUIN: Yes. Thank you, Tom.

CHAIRMAN KRESS: The design will come in with these in it or else.

MEMBER ABDEL-KHALIK: Right. But is this table all inclusive, though, or can somebody who is really bright come up with other strategies to address the basic problem?

MR. KING: Well, you can come in and propose whatever they want.

MEMBER ABDEL-KHALIK: Right. I mean these are just guides for the designer

MR. KING: These are requirements. If these were turned into a rule, they can still come in and propose what they want.

MEMBER WALLIS: Right. These should be in a reg. guide then. These should be in a reg. guide.

MR. KING: They just have to request an extension for that rule.

Or, I mean it sounded like somebody suggesting you be more general in the regulation and put these details in a reg. guide. That's a

possibility.

MEMBER APOSTOLAKIS: But don't you think, though, that you should be specific as to what the barriers -- no, the point is this: If your ultimate, if you want to argue that there will be two barriers between an initiator and release of radioactivity, that's very different from saying two barriers between initiator and damage to the fuel. So here it's kind of general. So --

MS. DROUIN: I don't want you all walking away with the idea that we're using the PRA to determine--

MEMBER APOSTOLAKIS: No, it's not PRA. It's not PRA. It has nothing to do. It has nothing to do with PRA.

MS. DROUIN: -- with to what extent these things are implemented.

MEMBER APOSTOLAKIS: The word "barrier," means I separate something from something, right? That's a barrier. And I'm asking what are these two somethings?

MR. KING: The two somethings are the frequency consequence curve. For a given frequency of a sequence you got to meet a certain dose. And overlaid on that is defense-in-depth requirement that

says even though I meet that dose, if it's a very frequent accident sequence, I want to make sure I still have those two barriers intact.

CHAIRMAN KRESS: These would apply to the licensing basis events.

MEMBER WALLIS: Can I answer George's question? I think the barriers are between the radioactivity that's in the fission products and the fuel and the public. Separating one from the other; that's why the barriers are there.

Did I answer your question, George?

MEMBER APOSTOLAKIS: But the question is whether that's what they meant. It could be.

MEMBER WALLIS: But that's you're trying to do or state.

MEMBER ABDEL-KHALIK: To me this is sort of meddling in design specs in a sense that your --

MS. DROUIN: Yes, it is.

MR. KING: Right, but we want a couple of other features on there for defense-in-depth.

MEMBER WALLIS: Like we're managing the design.

MS. DROUIN: No. You're not micromanaging the design. What we're trying to do is not make this a risk-based set of regulations. We are trying to make

all the decisions that are coming out of your PRA. Because the PRA has a lot of uncertainties associated with it. And the insights that can come out of the PRA are very good, but you know they could be wrong in places. So in terms of trying to identify the requirements that would go in this Part 53, we don't want them based just coming out of insights from the PRA.

MEMBER WALLIS: Well, I think you've got to be careful. Because if you have two barriers which are rather weak, and each has a probability of failure at point one, you may be better off with one barrier which is very strong and has a much smaller probability of failure.

MS. DROUIN: Well, now we can discuss whether these are the right defense-in-depth principles, whether -- or say we like the defense-in-depth principles, we could come in and debate is this the right way to implement each defense-in-depth principle.

MEMBER APOSTOLAKIS: That's what we're doing. We are not questioning --

MS. DROUIN: Right. But I mean it seems like you're coming back to well we don't need this. And I said no, this is an inherent part of not having

this thing risk-based.

MR. KING: And what you suggested can't happen there --

MEMBER APOSTOLAKIS: No. I think you misunderstand the questions. Nobody's questioning that statement there. No key safety function dependent on a single human action.

MR. KING: Right.

MEMBER APOSTOLAKIS: This is an extra defense-in-depth, yes. Human actions are in the PRA, they have probabilities. But this is fine.

The question is whether the provision of at least two barriers is meaningful. It's the implementation of the concept. That's what we're questioning.

MR. LEHNER: And actually, in chapter 6 we've stated it a little bit differently, which may be more to what you're talking about. We're saying that for the frequent events there's no barrier failure. For the infrequent events at least one barrier remains.

MEMBER APOSTOLAKIS: What are these ranges now? Infrequent is what?

MR. LEHNER: Frequent is greater then ten to the minus two. Infrequent is from ten to the minus

two to ten to the minus five.

MEMBER APOSTOLAKIS: And I think -- I'll getting there. I repeat. The fact that the frequency is there, you've shown systematically there is a barrier that is fine. That's all I'm saying. I'm not saying that the concept is wrong. It's just that this is not needed as opposed to what's next to it, which is needed. I like that. But you shouldn't rely on a single human action.

MEMBER WALLIS: You're mixing up defense-in-depth with what George is saying. I mean having a lot of barriers for the small things reduces the frequency. And it's already there.

MEMBER APOSTOLAKIS: Yes. That's how the frequency goes down.

MEMBER WALLIS: And I think defense-in-depth is something else other than that. It's putting in a barrier when you wouldn't think you needed it at all in order to be sure.

MR. LEHNER: We're not adding barriers --

MR. KING: That is wrong. I think what we're saying is each barrier when you're talking about the frequent events, and we don't want the barriers to fail, each barrier has to be more reliable than the ten to the minus two. It's not the combination of the

two. Each one. And then when you get down to one barrier, it's one barrier.

MEMBER APOSTOLAKIS: We exhausted this?

MR. KING: Huh?

MEMBER APOSTOLAKIS: I think we exhausted this. Let's move on.

Mr. Chairman, I have a question. Are we going to address differences between what you propose and what EPRI proposed, the PPMR?

MS. DROUIN: No.

MEMBER APOSTOLAKIS: And why not?

MS. DROUIN: Because we aren't prepared to do that.

MEMBER APOSTOLAKIS: But we will do it at some point? Because it's important to know how other people view the --

MS. DROUIN: I mean, if you all wanted to come back and do that comparison, we can. But weren't prepared to do that today.

CHAIRMAN KRESS: Or if you want to ask a question about --

MR. KING: There is an Appendix that compare the NEI proposal to what we're proposing.

MEMBER APOSTOLAKIS: Is NEI the same as EPRI?

MR. KING: No. They're two different organizations, but I --

MEMBER APOSTOLAKIS: No, but there is a report that says EPRI.

MR. KING: There is.

MEMBER APOSTOLAKIS: And they comment on your --

MEMBER BONACA: If I remember in the EPRI report --

MEMBER APOSTOLAKIS: Biff isn't there a report from EPRI?

MR. BRADLEY: There's an EPRI report that didn't come in through ENI. I don't know how that was--

MEMBER WALLIS: It come from SRI's.

MEMBER APOSTOLAKIS: But there is an EPRI report which was given to us. And there is a statement there that there are some significant differences. And for the life of me, I couldn't see them. And so I was wondering whether you guys knew what --

MEMBER BONACA: I agree a 100 percent. I have the same -- I can't --

MEMBER APOSTOLAKIS: I couldn't figure out what the one with the CCDF curve.

MEMBER BONACA: That's not the one that

has the CCDF curve. Yes.

MEMBER APOSTOLAKIS: You can go from one to the other. And they objected to using the existing--

MEMBER SHACK: That's one question. You know, why don't you put in a CCDF curve?

MR. KING: Yes, let's start that way.

MEMBER SHACK: You know, we keep coming back to that. Now, you know, it's not as though you guys are unaware of CCDF curves. You made a conscious decision not to go that way. I have my own guesses as to why you did that, but you can explain to us why you choose that.

MS. DROUIN: We had this discussion yesterday. And for the life of me, you know to be honest, I'm not sure anymore why we don't have it in here.

MR. KING: Well, the original reason was we calculate the QHOs, and that takes care of the cumulative effect.

MEMBER SHACK: I mean my argument is that the reason -- that what you've done here is to built into criteria that have already been accepted in regulatory space. You know, your frequency consequence curve is built on criteria that are already built into

your regulatory space. Your QHO is already built into your regulatory space.

If you were going to introduce a CCDF concept, then we'd have to decide what that curve would be. And I just assumed you want to deduct the discussion.

MEMBER APOSTOLAKIS: And I'm curious if you convert what they have to an approximate straight line, okay, the CCDF in low block space, whether that line would have a strong risk aversion if I --

MR. KING: No, it's--

MEMBER APOSTOLAKIS: Huh? It depends on the slope.

MS. DROUIN: Why the --

MEMBER APOSTOLAKIS: What do you mean the slope is one?

MR. MUBAYI: I'm sorry. It does have a risk aversion.

CHAIRMAN KRESS: Right near the end --

MR. MUBAYI: It's actually built into it. It would not be a straight line. It would come it in with a different slope on a log-log basis near the higher doses.

CHAIRMAN KRESS: Yes, but not much.

MR. MUBAYI: Pardon?

CHAIRMAN KRESS: You could put a straight line on there real easy.

MEMBER WALLIS: But the way that you interrupt -- the product of consequence and frequency is constant in this diagram.

MR. MUBAYI: It's not constant.

MEMBER WALLIS: It is. It's very constant. It's a slope of minus one.

MR. MUBAYI: If you --

MEMBER APOSTOLAKIS: But is it constant here?

CHAIRMAN KRESS: Almost, except right near the end there.

MR. MUBAYI: Yes, near the end. But that's you really -- where the risk aversion comes in.

CHAIRMAN KRESS: Where?

MR. MUBAYI: Up to 25 rem it's basically, you know --

MR. KING: A straight line.

MR. MUBAYI: Yes.

MEMBER WALLIS: Why is it not straight at 10,000 rem?

MR. MUBAYI: No, you don't go to 10,000.

MEMBER WALLIS: And then you turn around. Why is there nothing at 10,000, though? Why didn't

you--

MR. MUBAYI: They're all dead by then.

MR. KING: At that high we figure you probably won't meet the QHOs. It's a cut off.

MEMBER WALLIS: That can happen.

MEMBER APOSTOLAKIS: Well, what's the answer, Mary, that you don't remember why you did it this way.

MS. DROUIN: I'll tell you, it's for some reason I know we had convinced ourselves that it wasn't going to add to much value beyond what we had. I'm trying to find it in the document because --

MEMBER APOSTOLAKIS: Maybe for presentation purposes you should show first the line and then the discreditization.

MEMBER WALLIS: Well, I disagree entirely. You should start off with some principle of what's the effect on the public. And that's where you cc, whatever you call, the real FC curve is. Start with that. Now this is what we're trying to achieve. And then you can explain why this meets that goal.

MR. KING: Well, we did. We started with the QHOs and said this is what we're trying to achieve--

MEMBER WALLIS: You didn't start a

cumulative frequency curve.

CHAIRMAN KRESS: The problem I have with that is I can design a plant based on deriving requirements that it meet the QHO. And then somebody is going to say I want to put ten of those plants on a site or I want to put them in downtown New York or something. And all at once I no longer QHOs because I got ten of these plants or I got a site that wasn't suitable for it.

I don't like starting from the QHOs because that's a site related characteristic.

Now if you use an FC curve, cumulative -- complimentary cumulative distribution function that is equivalent of a CDF and a LERF except not saying the CDF and LERF comes from the QHOs, they're just design requirements. You make them such that your new plant if they meet this, then it's very likely that they'll met the QHOs on most sites. That's to be determined on a site basis and where they put them, and how many they're going to put there. But that's to be determined later. That's not a design function.

And that's where you need this FC curve. And it's not a public health representation as the QHOs. It's a design curve for fission product release.

MR. KING: But that doesn't solve your ten plants on a site issue?

CHAIRMAN KRESS: It does if you make that design curve such that about-- if they meet that, they're automatically meet about ten plants on most sites.

MR. KING: It lowers the --

CHAIRMAN KRESS: And that's where I say your FC curve ought to be the equivalent, functional equivalent of a CDF of ten to the minus five and a LERF of ten to the minus fix. Because then you can put ten of those on most sites and you'll meet the QHOs.

MEMBER APOSTOLAKIS: But I don't --

CHAIRMAN KRESS: You'll have to determine that later.

MEMBER APOSTOLAKIS: I really wouldn't want the design curve to be so low that if you put ten, you meet the site requirements. You should have separate site requirements

CHAIRMAN KRESS: Sure.

MEMBER APOSTOLAKIS: And then, you know, you design.

CHAIRMAN KRESS: Sure. But what happens--

MEMBER APOSTOLAKIS: And then you're

saying, you know, for this site I meet it with -- because what if they buy, you know, very small reactors.

CHAIRMAN KRESS: But if you have a FC curve for design, you have to put it at some level. That if you put so that likely you'll only meet one plant on a site to meet the QHOs --

MEMBER APOSTOLAKIS: Sure. Yes.

CHAIRMAN KRESS: Or there's two of them or three of them. I said use ten. That's probably your base.

MEMBER APOSTOLAKIS: But there will be an extra site requirement.

CHAIRMAN KRESS: If you had to do that, there's --

MEMBER APOSTOLAKIS: First of all, the QHO--

CHAIRMAN KRESS: The site requirements, though, should be the QHOs because --

MEMBER APOSTOLAKIS: Expanded, though?

CHAIRMAN KRESS: Expanded, yes.

MEMBER APOSTOLAKIS: To include societal things.

CHAIRMAN KRESS: Yes. Right. But that's separate. You don't want to include those in your

design except implicitly.

The FC curve you come up for design acceptance ought to have in mind that if I stick two of these plants on any site, I'm likely to meet the QHOs. But you don't want that to be a --

MEMBER APOSTOLAKIS: On what site, though? You see, that's my point. You may design the thing and depending on the site you may be able to put three such reactors or Xs.

CHAIRMAN KRESS: You'll have to decide that when you select the site.

MEMBER APOSTOLAKIS: That's right.

CHAIRMAN KRESS: You go to the site and say can I put five of these or one of these or ten. And if there's already two reactors there, maybe you don't use that site.

MEMBER WALLIS: But, Tom, the QHOs say nothing about siting. I thought the QHOs referred to some lunatic who stood at the site boundary and waited to be ready.

MEMBER APOSTOLAKIS: He's a regular type person --

CHAIRMAN KRESS: I thought George -- and I'll say you need another augmentation. Those are good rules, those QHOs.

MEMBER WALLIS: But it doesn't say you can't put it in New York City.

CHAIRMAN KRESS: No, but --

MEMBER WALLIS: QHOs don't say that.

CHAIRMAN KRESS: But well there's other population requirements.

MEMBER APOSTOLAKIS: But let me come back to my earlier question. Is it correct to assume that there is an NEI proposal? Biff, listen. Is there an NEI proposal on the framework?

MR. BRADLEY: We commented on --

MEMBER APOSTOLAKIS: You commented on the proposal by the staff, but you're not proposing anything yourselves?

MR. BRADLEY: We have no independently developed a framework.

MEMBER APOSTOLAKIS: Okay.

MR. BRADLEY: We had some comments on the staff framework.

MEMBER APOSTOLAKIS: Okay. So we have the comment --

MR. KING: And in the NEI 020-02, that was the thing that kicked this whole project off.

MR. BRADLEY: Yes. That was -- but I think we've all pretty much moved beyond that point.

I'm not assuming that 02, whatever that is, is still currently in play at this point.

MEMBER APOSTOLAKIS: But in seems to me in order --

MS. DROUIN: And I would go even further that NEI has moved away from what you all in 02-02?

MR. BRADLEY: Yes, we have. Yes.

MEMBER APOSTOLAKIS: I would say that for this Committee to make an informed decision at the end, whatever the end is, we would really need to know in detail what other organizations have proposed and how they differ from yours. And if we don't do this today, when are we going to do it?

And there is the EPRI report and the IAEA report with which I think you were involved.

So, Mary, when are we going to do this? Are we going to write a letter after this meeting?

CHAIRMAN KRESS: Yes. But our letter after this meeting could -- number one, it has to respond to a staff requirement that's -- they're asking about separate items. We don't need to respond to those. But I thought in addition this meeting would be a meeting where we could say do we have a problems with this whole concept and discuss that.

MEMBER APOSTOLAKIS: So there will be

other occasions for us to write a different letters?

CHAIRMAN KRESS: I don't know.

MEMBER SHACK: Staff is planning to stop work.

CHAIRMAN KRESS: I think this is -- if we go write a letter, this probably ought to be the time to d it.

MS. DROUIN: Let me talk about just real quick trying to get to your question on comments that we have received. I mean, you know here's all the comments that came in from the last -- let me back up.

You know we had a major workshop in March of '05. And we had an equivalent, you know, bound comments that we got. And we took those into consideration when we went into this latest revision. We have gone through all these comments.

Generally if I had to summarize the comments in a couple of sentences, generally at a conceptual level everybody was very favorable. Liked the concept, et cetera.

Where the difference is, if you want to call them differences, or that the comments really kind of got into the details of it and it was more they weren't really yes or no on some of this stuff, it was I'd like to see this implemented and tested.

And then you can come back and really then get into the details of what is the right way on some of this stuff. But it wasn't -- I mean, there were some places I don't want to say where they weren't in agreement. But for the most part it was I want to see how this is implemented, let's test it.

MEMBER APOSTOLAKIS: Which seems to me is your position, too, isn't it?

MS. DROUIN: We don't disagree. Because a lot of this stuff, you know we're going into new area. It sounds good. We did a very limited test on just trying to see if you use the selection of the licensing base events. You know, we went to a current plant where we had a PRA and tried to gain insights of how it would work there. It seemed to work. But that was a very narrow thing that we did, so I don't want to misrepresent it. Because it is very, very narrow and limited.

But overall how would some of this stuff work and how would that translate into requirements? We have come up with a draft. It wasn't in this July version. It would be in the version that we would publish this summer is here's using this approach. And once you turn that crank what does that really mean in terms of specific requirements. We've taken

a shot at that. But it would be nice to test this.

MEMBER APOSTOLAKIS: So what is Bill said true, you're going to stop working on this now and that's it? We forget about it or what?

MS. DROUIN: If we go back -- let me get back to our presentation. I'll just skip to the very end.

CHAIRMAN KRESS: Slide 10.

MEMBER WALLIS: Before you go there, George --

MS. DROUIN: Oh, no it's --

MEMBER SHACK: Slide 10.

MS. DROUIN: Yes. Sorry.

MEMBER APOSTOLAKIS: So what is it?

MS. DROUIN: You know right now what the plan is on the framework is that we would publish it the way it is now. It would be published as a NUREG. We add an appendix to this NUREG that would go through and summarize all the stakeholder comments. And the way right now we're looking to summarize them is that we've grouped the comments into five categories.

Comments that what we call are observations and don't really require for you to make a change to the framework.

Comments that deal more with

implementation of it and they would be dealt with if you ever implemented it.

Comments where they really caught something that we need to change right now.

The next set is comments where we just disagree. And we would have an explanation of why we disagree.

Which category did I forget? There were five groups.

And this would all be in the appendix.

MEMBER APOSTOLAKIS: Okay. But let's say that a miracle happens and DOE decides to in fact built the NGNP. Then in my view if you stop working on this, the most likely way that they will choose to proceed will be with the existing regulatory system amended or with exemptions here and there, just as the PBMR people three years ago told us they would like to go.

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: So in real life are we going to have an opportunity to actually test this? Because the guys, the NGNP people don't care about frameworks. They will say they want to build this. We're not going to try and test your ideas.

MS. DROUIN: I'm going to say something

that I'd for Stu to get up and correct me if I say it incorrectly.

MEMBER APOSTOLAKIS: Well, let him say it first.

MS. DROUIN: But in the advanced reactor research plan, you know we did put in there that in terms of when we look at the NGNP in particular and develop the licensing strategy and develop some of this, that you know we were going to rely on heavily on what's int he framework.

MEMBER APOSTOLAKIS: Oh, you would.

MS. DROUIN: But I don't know if you want to --

MEMBER APOSTOLAKIS: Stu?

MR. RUBEN: Okay. Stu Ruben, Office of Research.

One of the projects that I've been involved with in addition to supporting Mary is be part of the team, interoffice team looking at the licensing strategy for the NGNP.

The first piece of that strategy is what we've come to call a licensing approach. And the big part of that is to what extent should probabilistic information be used in the development of the requirements for licensing the plant. And the spectrum

of options that we're looking at right now includes going all the way back to basically a very deterministic approach that we used very early on, 30 years ago, at Fort St. Vrain. Looking at a prism-type approach, which was basically deterministic and using probabilistic insights to supplement that.

The next option is to use what we'll call a risk-derived approach, one that we've never seen to completeness. And we're now seeing what the challenges would be to actually go down that path. Many policy decisions would have to be made to implement that. So we need to keep our eyes wide open.

The final option would be to actually base it on new regulations that would be derived from the framework technology. And we're looking at --

MEMBER APOSTOLAKIS: How is the third option different from the fourth?

MR. RUBEN: Well, the third option basically we would be using the current body of regulations that were derived for light water reactors. And we would adapt those requirements, wouldn't write any new requirements. We would simply adapt those requirements for the NGNP design, being a very high temperature gas reactor with PRA insights.

MEMBER APOSTOLAKIS: But I thought that was the second one you had.

MR. RUBEN: No. No, the second one is you start out with a very deterministic approach to selecting events, to selecting safety systems, to establishing margins, the way you do your safety analysis. But you would still have the PRA to see, hey, did I forget anything in selection of events, let's say.

MEMBER APOSTOLAKIS: What's the first one then?

MEMBER POWERS: Oh, Jesus. I don't care anymore.

MS. DROUIN: Stu -- Stu --

MR. RUBEN: All I'm saying is there is a spectrum. We're looking at what we'll call the risk-derived, use of a PRA as an underlying basis for event selection and applying engineering judgment to augment that, et cetera. Okay. We're looking at that. And we're working with DOE. And presumably the industry will weigh in on what their preferences are.

MS. DROUIN: And in your licensing your plant, you got to license it against something. And what exists right now is Part 50 and Part 52. That's what exists.

MR. RUBEN: That's what exists.

MS. DROUIN: That's what's on the table. So if something came in today, right now, they would have to be licensed under Part 50/52. So then the question is can the framework document in terms of the technical issues that are in there, and there's policy issues associated with, can you use some of that work in helping to identify what in Part 50 is applicable to this new design and what you can give an exemption to. To help you make those decisions.

So right now that's the only way the framework could be used.

Now if you're looking down the future, you know, do we create a new set of regulations so that when the applicant comes in it's not just Part 50 or 53. I mean it could be a new Part 50 that has a new appendix that has all this stuff in it. Or it could be anew Part 53, that's just packaging. But it's a new whole set of regulations against which you're going to license that plant. But I mean as of today, you know to say I want to license against the framework, that is a meaningless statement. The framework is not a set of regulations. It's Part 50 and 52 and do you use the thinking, the technical thinking in that document to help you make decisions under the current 50/52.

MEMBER ABDEL-KHALIK: So why don't you publish this framework as an SRP?

MS. DROUIN: Because it's not an SRP.

MR. KING: Because it's not an SRP.

MS. DROUIN: It's not an SRP. It's technically document.

MEMBER SHACK: But functionally it would provide the same guidance.

MS. DROUIN: You could develop an SRP.

MEMBER SHACK: Correct.

MS. DROUIN: Based on -- and those are kinds of, you know, decisions you know. You could develop some regulatory guidance for the licensee. You could develop an SRP to help the staff in making these decisions under the current Part 50/52.

MEMBER APOSTOLAKIS: When Commission McGaffigan said let's stop the development and try to test it, you know, for a particular technology, which technology do you think he had in mind? I mean, would that be the test would not be a real application for a license, right? Because you can't really do that. You can't use some applicant's application testing your framework. The guy wants decisions. So I don't understand this.

MS. DROUIN: Well, it depends on what

you're trying to test. I mean, you know, if you're trying to -- you could come in and develop a regulatory guide to support the license of an advanced reactor Part 50 and you're testing that regulatory guide as part of that application; yes, you could do that. Would you want to do it that way is another question. But you certainly could do it that way.

MEMBER APOSTOLAKIS: Well, I don't know if anybody thinks that way, but it seems to me this is the end of this. Judging from what Stu is saying, the most likely option is the second. They will go using existing criteria, supplement it by risk insights, which makes perfect sense. In fact if you want to have some decisions in a reasonable amount of time.

MR. RUBEN: Well, I would say from a decision point of view that might be the safest, surest way to go. But whether or not industry would be enthusiastic about that, at least for HGGRs, it would be unlikely.

The prism reactor submittal was based on a deterministic approach fundamentally and using PRA to supplement it, or risk-informed.

The HGGRs, the VHTR, the NGNP I suspect would like to see a more risk-derived approach.

MEMBER APOSTOLAKIS: They understand that

PBMR guys are submitting white papers those guys are reviewing?

MR. RUBEN: Yes.

MEMBER APOSTOLAKIS: What kind of regulatory process do they --

MR. RUBEN: Okay. They are -- it's kind of hybrid, let me say that. They are basing their application on Part 52 and Part 50. As Mary said, those are the only regulations that exist right now. It's the only basis that they could apply for a license or a license or a design certification. However, in terms of applying those regulations it wants to use heavily the PRA and probabilistic insights to select events, select design basis events, select safety related system, establish vessel treatment requirements, establish defense-in-depth requirements, much like the framework is trying to do from a blank piece of paper. But if you look at those front end pieces, the framework and the PBMR approach have very much a lot in common. And I think your question to see those two front end pieces would be very helpful and informative at some point when we're ready to talk about that.

MS. DROUIN: I think in terms of testing it, my personal view is that you should go the next

step, and that next step is trying to develop the regulatory guidance of how this would get this implemented and help you in your decision making. And in developing that, you're testing it in essence.

MEMBER APOSTOLAKIS: But shouldn't you have a design in mind?

MS. DROUIN: Yes, you should.

MEMBER APOSTOLAKIS: Which one?

MS. DROUIN: Oh, I'm using a gas filled reactor. Absolutely.

CHAIRMAN KRESS: I'd use the PBMR because it's already got all the --

MEMBER APOSTOLAKIS: But there are no plants to do this.

CHAIRMAN KRESS: -- necessary inputs you need.

MEMBER APOSTOLAKIS: Yes, but there are no plants to do it.

CHAIRMAN KRESS: Huh?

MEMBER APOSTOLAKIS: There are no plants to do anything like that. Right now there are no plants to test this.

CHAIRMAN KRESS: No.

MR. RUBEN: Not the framework's scheme of event selection, et cetera. But the front end piece of

frequency consequence curve that there has been discussion about, they start out with that as a starting point as well, for example.

MS. DROUIN: Right. But you know, and therein lies the problem. You look at the high level. You know, everybody conceptually we're all in agreement. The disagreement comes in the next level, and that's where you need to write, you know or developing that implementing guidance to see what works and what doesn't work.

MEMBER WALLIS: When you wrote the framework did you start off with a problem definition phase where you said this is why we can't use the present regulations, this is what the new regulation based on that framework have to achieve?

MS. DROUIN: Yes.

MEMBER WALLIS: You wrote all that stuff down?

MS. DROUIN: Yes.

MEMBER WALLIS: And you wrote down all the variety of reactors it has to be able to handle and all that stuff. And then when you got to the end did you check that you met the specs that you laid out at the beginning?

MS. DROUIN: I think we have. Whether

we've been successful or not --

MEMBER WALLIS: Okay. I wasn't sure that happened.

MS. DROUIN: But that's where -- you know, why this document is as thick as it is. And a lot of that information that you're looking for, Graham, is in these detailed appendixes.

MEMBER WALLIS: What's in the appendixes. Yes, okay. I didn't get to those appendixes. Okay.

What's a barrier? What's a barrier? I think the fuel has various barriers in it itself, doesn't it?

CHAIRMAN KRESS: Yes.

MEMBER WALLIS: So how many barriers are there in the PMMR fuel itself?

MEMBER POWERS: Essentially none.

MEMBER WALLIS: Well, he says there are none, but they claim --

MEMBER POWERS: That's what I was waiting for.

MEMBER WALLIS: But don't they claim there are several barriers in the fuel itself.

MR. KING: There is only one they rely on for fission product retention.

MEMBER POWERS: Right.

MEMBER WALLIS: Because there isn't a problem with how many barriers are in the fuel?

MEMBER POWERS: Which is essentially useless.

MEMBER CORRADINI: Don't hold back.

MEMBER POWERS: Let's see, a couple of things. At some time I've got to understand why we have to design this CDF or frequency consequence curve for ten plants on a site. And I'm not going to bother you about that since that's not your proposal.

CHAIRMAN KRESS: You have to come up with a number.

MEMBER POWERS: What I see, Mary, when you talk about defense-in-depth, you say two words, two phrases one of which is welcome and one of which grates like a fingernail on a blackboard to me. Okay.

MS. DROUIN: Wait a minute. One of them is welcome and one is the blackboard scraping? Well, those are kind of extreme.

MEMBER POWERS: Yes. You say we use defense-in-depth to cover uncertainties and then you also as you talk a little bit say okay, we also do it because we may be wrong. And in can you elaborate a little bit for me here on this at all? And while you're doing that explain to me a little bit how the

problem, the inherent difficulty with defense-in-depth as a safety strategy is its unbounded.

In other words, if I have one containment, why not two? And if I have two, why not three? If I have one redundant system, why not a diverse of redundant system? And then why not another one if defense-in-depth -- how does your strategy bound defense-in-depth, not so much at the containment level but at the lower levels?

MS. DROUIN: Okay. Well, let me try and do these one at a time.

MEMBER POWERS: Sure.

MS. DROUIN: Okay. The first one was, you know, uncertainties. I truly believe you have defense-in-depth because of uncertainties. Now that leads to the question of what kind of uncertainties are you talking about. And I'm not talking about the uncertainties that are in your PRAs in terms of data. This is more to me, you know knowledge.

There's just some things that we just don't know about. And I don't know how you say anymore than that, because how do you talk about what you don't know? But we don't everything. So to make absolute decisions based on your risk on being able to quantify everything, you can't quantify or you can't

analyze, whatever the word you want in there, what you don't know. So you do need something there to address the things you don't know.

Equally, and I think it's been shown, that sometimes we think we know something or we think we're able to model something and our knowledge was incomplete. And that could be done to unknowns. But it was just not accurate. And so you could make decisions based on the wrong information because your information wasn't accurate. So you need defense-in-depth I'm a firm believer.

MEMBER WALLIS: But as you get more knowledgeable, don't you need less of it?

MS. DROUIN: Yes. But then that kind of almost gets to Dana question, how do you know --

MEMBER POWERS: When you know enough.

MS. DROUIN: -- how much that void is. You know, you don't know the size of the void. I mean, but hopefully you know as --

MEMBER WALLIS: When I look at the thermal shock study, which is an example of probably good work done here, what they did was to put in a lot more knowledge and a lot more probabilistic stuff and try to get rid of the stuff we don't know, so that we can make a better decision.

MS. DROUIN: Yes. Yes.

MEMBER WALLIS: And presumably that's the way you ought to be driving to do away with the need for defense-in-depth.

MS. DROUIN: Yes, you should. I don't disagree with that. Okay, now --

MEMBER POWERS: I think you do disagree with that.

MS. DROUIN: Huh?

MEMBER POWERS: Because again you're at the size of the void problem.

MS. DROUIN: But I think you can get a little bit educated on the void problem. I think to think that we're smarter today than we were 2000 years ago about some things.

MEMBER APOSTOLAKIS: Light water reactor.

MS. DROUIN: And I would like to think that 4000 years from now they'll be smarter. So to say we're totally ignorant on the void I think is not, you know, accurate. But there is some uncertainty there.

I just lost my train of thought.

So given that premise, I'm going to go back to Reg. Guide 1174 for a moment that talked about defense-in-depth philosophy and then they had these

principles.

What we've tried to do in the framework is suddenly a little different. Because in Reg. Guide 1174 it came in with a basic assumption that the current body of regulations provides adequate defense-in-depth and it doesn't define it. So it's come in with saying we have defense-in-depth in there and it's adequate, but now as we make changes to the plant we want to make sure we don't degrade whatever this defense-in-depth is.

The framework is different because now we're trying to say explicitly what defense-in-depth is, why have you put something there for defense-in-depth. So that say you got the plant design and you're 10/20 years from now and you want to make a change, you can -- now you know that if I may a change there, I'm making it on a defense-in-depth versus right now I don't know what it is. It's this unknown thing, I just know I have it. So it's different from that versus now you're trying to design a set of regulations and you want to make sure you have adequate defense-in-depth. Now you really have to have a need for being a little bit more definitive of what you mean by defense-in-depth.

So given that we tried to take a shot at

that. And our shot was to do it in two approaches. Start first with, okay, in identifying what requirements you need for this Part 53. We're going to try and identify those. I mean we could have started off and said, okay, we're going to start from design, operation, maintenance. But we didn't start there. We wanted to start from a defense-in-depth approach that says we're going to look at from you don't want to maintain stable operation, and then ask the subsequent questions. Well, if we don't have stable operation, you want systems. If you don't have this, than this to carry you all the way through from challenging the plant design to ultimately having releases.

So that was trying to now be complete.

MEMBER POWERS: There's a reason I think you're my hero.

MS. DROUIN: I'm sorry?

MEMBER POWERS: That's just a tremendous answer. I really appreciate that answer.

MS. DROUIN: Am I finished?

CHAIRMAN KRESS: I want to make a comment on the ten --

MEMBER APOSTOLAKIS: I thought the question was why two and not three. That was not

answered.

CHAIRMAN KRESS: I'm going to answer that one.

MS. DROUIN: He told me he was happy, so I'm going to stop.

MEMBER POWERS: You have given an understanding of the first question.

MS. DROUIN: Okay.

MEMBER POWERS: On how you're viewing defense-in-depth when you say your definition of uncertainties encompasses what I think is the biggest uncertainty that we have, and that is the fact that not only are there things that we don't know, but there are things that we're probably wrong about now.

MS. DROUIN: Yes. And I could tell you, you know you look over time and I can go back to if you look at WASH-1400, our understanding of accidents, which was a tremendous progress, still had some basic flaws in it that we have learned now, you know, quite a difference.

MEMBER POWERS: I mean if you'd come to me and said, gee, it's based on uncertainties and I go through and I do this parameter variations and I find out what areas uncertain in, that's where I put defense-in-depth, you know I'd probably be throwing

heavy objects at you and things like that. But, no, I think we agree very strongly in the view.

The struggle that I've always had is that, not for the containment because that's a very understandable thing and it's understandable if I have one and not two, and things like that, even though the Germans like two, it's in the more microscopic applications. Particularly in electrical engineering aspects and some of the plumbing aspects where people come in and justify something based on defense-in-depth that I worry about bounding. And, you know, where is it that we have enough knowledge in PRA to say, no, we can decide this strictly on a risk assessment basis?

For instance, you might argue, say, the reactor protection system is an area that we have enough knowledge that we know, you know having two diverse ones is enough. We don't need three. One might argue that. There's been a recent event that may dissuade you of that. But --

MS. DROUIN: I'll be honest. I don't think we have a good answer to that. And I think that if you look at, for example, the evolution of the ATWS rule, you know our knowledge of how the RPS worked, and you know I'll talk with boilers because I'm most

familiar with that, you know our ability in terms of how we modeled it led us to believe that there was a very reliable system. And now I think if we modeled it with today's knowledge, we would have come up with a different answer. Because we didn't recognize the common cause associated there and you got into the --

MEMBER POWERS: Reactor scram, just discharge volumes.

MS. DROUIN: The discharge volume. Thank you. And we didn't model that. And that now a better understanding of that today would have led us.

So here to me is an example of not a full knowledge, things that we thought we didn't quite know as well as we thought we did. I think we're going to always be challenged with that kind of stuff.

So what we're hoping is that whereas in the past when you look at Part 50, you know I think defense-in-depth was approached in somewhat an ad hoc manner. This sounds, you know because we're not sure here, let's put things in. We've tried to be, maybe not successfully, but we've tried to approach it in a systematic structured way that would hopefully get to some of that stuff.

MEMBER POWERS: Yes. I think you're on the right track. Define what things you think are

defense-in-depth, sometimes they're actual structures, sometimes they're things like Tom is talking about, which are not structures but the way you approach things.

MS. DROUIN: So that's why where I started. You know we had the strategies, we could have just stopped there. But we didn't stop there. And the next part was coming in and saying okay, we've got at a high level these strategies which are defense-in-depth at a high level. But now to go down to the lower level was let's define principles. And then how should each of those principles be met for each of those strategies.

MEMBER POWERS: Okay.

MS. DROUIN: So that was the approach in trying to address both of those that we took.

MEMBER POWERS: Can you chat with me just a little bit about how you see QA/QC in this mix of risk information and defense-in-depth?

MS. DROUIN: Say that again.

MEMBER POWERS: How do you see Appendix B, QA/QC sort of things in this mix of defense-in-depth and risk?

MS. DROUIN: Well, when we go back -- you know, we didn't get to that. And maybe we should spend

some time talking about that -- is the safety classification, you know, in your special treatment which is getting in Appendix B. Maybe we should talk about that now.

MR. KING: Yes. But QA is not part of our defense-in-depth limits. QA is a good engineering practices that applies across the board. And that's how it shows up in the framework.

MEMBER WALLIS: Can I add something to the defense-in-depth discussion and how much it needs to be? You have trouble I think with the simple question that you get from the public on how safe is this design. Even from the technically informed public. How safe is this design? If you show me an FC curve, a positional type, I can understand what it is that you're trying to do when you say I've done everything I possibly can to make sure that this design meets this FC curve. Then I understand what you have is some indication of how safe it is.

CHAIRMAN KRESS: Absolutely.

MEMBER WALLIS: But if you say I've put in a lot of defense-in-depth, that doesn't tell me anything about how safe it is.

MS. DROUIN: Well, the defense-in-depth was not to answer that question.

MEMBER POWERS: She does it in a different approach it seems to me.

MEMBER WALLIS: Well, I know. But the public is asking a question.

MS. DROUIN: Right. But we have an answer to that and we have defined, you know, safe is safe enough is that you've met the QHOs.

CHAIRMAN KRESS: Only with the design.

MEMBER WALLIS: With defense-in-depth?

MR. KING: You can take credit for the defense-in-depth measures when you do that.

CHAIRMAN KRESS: Let's talk about this QHO stuff again, because Dana asked about where I come up with ten reactors on a site.

Suppose I had an FC requirement that was approximately equivalent of a CDF of ten to the minus four and a LERF of ten to the minus five. Supposedly those are derived back from the QHOs for representative sites.

MEMBER POWERS: Which does not make sense.

CHAIRMAN KRESS: Yes. If I had a design just to meet that, that means I put one plant on a representative site, it meets the QHOs. I can't put more than one. So I can't put it on a site that already has reactors on there because you already

exceed the QHOs.

So I say well let's make the design a little better than that so I could put economic plants.

MEMBER POWERS: You're making an economic decision. You're a stock broker.

CHAIRMAN KRESS: No.

MEMBER POWERS: This is not a stock broker agency. This is not a bank board. This is safety organization.

MS. DROUIN: Well, I don't agree that you should not be allowed to add -- this is a personal thing. And I'll tell you the opinions differ among the staff. But I personally -- and I want to emphasize personally -- I think that you should be allowed to add at least one plant to an existing site even though that plant might be at the QHOs.

CHAIRMAN KRESS: Well, I think we wouldn't disagree with that. But --

MS. DROUIN: I don't think you should preclude --

CHAIRMAN KRESS: But only if that plant is well designed so that it adds an insignificant increase to that risk, or almost insignificant. And that level to me is not the QHO level, it's a factor

of ten below the QHO. Then you can add that to a site that's already got to plants on it. I don't care. Because it's not going to add any more risk to it.

And not only that,if you got a pebble bed modular reactor with ten modules, I think each module ought to be designed with one-tenth of the -- it ought to be designed with the CDF of ten to the minus five, each module and a LERF of ten to the minus six. And therefore you got ten modules and you meet the QHOs with all ten of them.

MR. KING: There is a policy issue on this very subject. But the Commission hasn't taken action.

MEMBER APOSTOLAKIS: The Commission was split.

CHAIRMAN KRESS: I know.

MR. KING: And I think the staff's position now, Mary you can correct me, is that on a site basis you've got to figure in the cumulative effects.

MEMBER APOSTOLAKIS: Yes, of course.

MR. KING: And you grandfathered the existing plants. But for any new ones.

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: I mean our recommendation is the SECY paper that we went forward on integrated risk

that an existing site where, you know plants already existed, those are in essence grandfathered. And they're grandfathered because we have said they're safe.

CHAIRMAN KRESS: Yes, but I think you're making a mistake there. Because if I were the public living around one of those sites, I would say, "Okay. I've already accepted those two plants that are there now, even though I'm at higher risk than I should be. But I don't want you to build another one there. Find another site."

MS. DROUIN: Well, we understand that. I have to tell you that when we went to the Advanced Reactor Steering Committee because there was the public perception of how to -- there was issues with both. Whether you factor in the risk from the existing plants or not, you're going to have a challenge to explain to the public. And it was unanimously across all the -- across the entire members of the Steering Committee that in the end they felt that they could explain the fact that they've grandfathered the existing plants.

Now for new plants, you know, you would look at the integrated risk. Whether if you want to put one plant there or ten plants there, you're going

to have to look at the total integrated risk.

CHAIRMAN KRESS: I think in general some sites you shouldn't build another plant on, whether it's a very insignificant addition to the risk or not.

MS. DROUIN: For what --

CHAIRMAN KRESS: We need to identify which ones of those sites there are. And there are probably about six or seven of them.

In order to identify those I think you need some site criteria that talks about the societal risk, for example. And you need to exclude those sites from having another plant on it, even though a new plant may have an insignificant risk addition. I think that's just good public relations. I think the public understands that.

What you can do is just not add to the risk.

MEMBER APOSTOLAKIS: Can we change the subject a little?

CHAIRMAN KRESS: Yes, that's a different subject.

MEMBER APOSTOLAKIS: I have two comments. One addresses what Graham raised.

Before we go to that subject specific, in the existing certification process because the

applicants propose the use of active systems that are non-safety related, whether it's a safety related system or passive, we have this regulatory treatment of non-safety related systems. But one of the things that they're expected to do is to do a circled focused PRA in which you only take credit of the safety system. Does the framework address any of this or is that too much for the framework?

MS. DROUIN: Well, the framework if you're going to take credit for the structure system or component in terms of meeting your required -- if you're trying to meet the frequency consequence curve or whatever quantitative goal that you're required ultimately to meet, then that becomes safety significant.

Now how much treatment it would get would be relative to how significant it is. But it would be -- you know, we don't use the term in the framework, you know safety related or important to safety. We use the term risk significant. What is that?

MEMBER APOSTOLAKIS: But you're not requiring a PRA where certain things are assumed not to be there?

MS. DROUIN: No. If you take credit, like for example in today's PRA where you go in and see

CDFs and LERFs of certain value, they've taken credit for a lot of non-safety related equipment. You know, boilers across the board take credit for the surface water cross tie. They take credit for the fire system. For a lot of systems that are not safety related, but it's one of the reason why their CDFs are so low because they take credit for all this stuff. And the position in the framework, if you're going to start taking credit for this stuff because you're identifying your licensing base events because of that, well then that is now going to become part of your safety significant components.

MEMBER MAYNARD: But there are other regulatory coverage of a lot of those systems. So calling something safety related isn't all that magic in itself. You have other rules, the maintenance rule; things that you consider important to the overall operation of a plant from a safety standpoint. Some of the non-safety related systems that are credited in mitigated accidents are covered under the maintenance rule and other provisions.

MS. DROUIN: Yes, I understand that. Right.

Now because in the framework they're deemed safety significant, they don't all being

required under the framework the same treatment. So the treatment is grade relative to how important they are. And that's where we start bringing in the importance measures and stuff like that to determine to what extent, what kind of treatment they should receive.

CHAIRMAN KRESS: Why don't you explain to us how you're going to determine that SSCs in the new framework? That would be a good place --

MS. DROUIN: Okay. Why don't we just -- I know John's just been chomping at the bit to get to those. So we did have a couple of viewgraphs --

MEMBER APOSTOLAKIS: And that's in fact one of the things I didn't understand with EPRI. They say that that's a difference between them and you. And I just don't understand what the difference is.

MEMBER WALLIS: When you talk about safety significant SSCs?

MEMBER APOSTOLAKIS: Yes, that's what they're going to talk about.

MEMBER WALLIS: Now you just, Mary, that you don't have any safety significant SSCs. They're only risk significant. You said that about a minute ago.

MS. DROUIN: Yes. But I said I couldn't

remember my exact words. I know we didn't call them safety related or important to safety. I was trying to remember exactly. And we call them safety significant.

MEMBER WALLIS: Yes, but that means risk significant, doesn't it?

MS. DROUIN: Yes.

MEMBER WALLIS: Now did you ever question why you have these at all?

MS. DROUIN: I don't understand your question.

MEMBER WALLIS: Well, if the plant is meeting is safety objectives, then it would seem to me that maybe the plant management needs to have a way of monitoring or choosing or evaluating things which are more important to risk. But why do you have to step in and say you're going to monitor all these things? Why should you define certain things as being safety significant? I mean, the plant designer and manager knows that certain things are significant for safety and presumably takes care of them. Why do you have to step in and regulate them all?

MEMBER POWERS: It's the most important thing that comes out of the PRA.

MEMBER WALLIS: Well, we know that. We

know that. The PRA will tell you that. It's telling the plant that, too. So why does the Government have to go in and --

MEMBER POWERS: Because sometimes the plant doesn't get involve --

MEMBER WALLIS: Oh, because you can't the trust to do it, is that what it is?

MEMBER APOSTOLAKIS: Because there is an assumption there that there is such a safety culture out there.

MEMBER WALLIS: That's right. There's an assumption that the plant isn't going to do it.

MEMBER APOSTOLAKIS: And that is not something that you can defend very well.

MEMBER WALLIS: I just wonder if you really need to do it this way.

MS. DROUIN: Well, we were not proposing--

MEMBER APOSTOLAKIS: Ideally, yes, you're right.

MEMBER POWERS: Apparently so.

MS. DROUIN: I mean, we were not proposing to not have any special treatment requirements. So once we made the assumption we're going to have special treatment requirements, then what are those requirements and what do you impose them on?

MEMBER POWERS: Now the question comes out how you select these things.

MS. DROUIN: Exactly. I thought that --

MEMBER WALLIS: And?

MS. DROUIN: The answer.

MR. LEHNER: The way the framework describes how you select the safety significant SSCs is tied to the licensing basis event. The framework says that if you took credit for an SSC in showing that a licensing basis event meets the frequency consequence curve, then that SSC is safety significant.

MEMBER POWERS: Isn't that getting us right back into the 40,000 things that are on the Q list?

MR. LEHNER: No, I don't think so.

MS. DROUIN: No.

MR. LEHNER: Well, let me also add that the special treatment, as Mary said earlier, the special treatment is not necessarily the same treatment for all the SSCs that are safety significant. The special treatment is supposed to reflect the fact that the SSC is reliable under the conditions that you took credit for when you did the PRA.

MEMBER WALLIS: So you have a PRA and it says her's a pump, and it has a certain reliability. And when you push a button it will start a certain percentage of the time and so on. Well, that's in the PRA already, isn't it?

MEMBER POWERS: And here's the problem I see, Graham, is that he says if you took credit for it in your licensing basis event, then you got to treat it as a safety significant --

MEMBER WALLIS: So you got to check that what you have in your analysis, it's the same with reality.

MEMBER POWERS: Well, what we know is what's in the PRA is a very small fraction of this. This is a large set of things of which only a very, very small fraction is actually in the PRA.

MEMBER WALLIS: So how can they take credit for it in their -- in the LBEs, if the LBEs come from the PRA then?

MEMBER POWERS: Because you say look, I'm going to turn this thing on, and the system works. So the system is made up of a bunch of components, there are a bunch of things that allow you to turn it on. I mean, the ratio is about -- there are about 2000 things in the PRA, there are about 40,000 that end up

being counted here. I mean, it's a huge ratio of things that are not in the PRA

MEMBER CORRADINI: In terms of the rare number of reliability.

MEMBER POWERS: Yes, things you have to be aware of.

MEMBER CORRADINI: It's an accumulative -- it's a system level reliability.

MEMBER APOSTOLAKIS: But that will bring us -- I mean if they declare all these components as safety related, we're going back to the arguments of the special treatment. And that was a major complaint that just because the diesel is safety related, that doesn't mean the little component down here of the 2000 subcomponents of the diesel should be safety related, too. And we have this mechanism of a scheme with importance measures.

But I think Graham's question is more philosophical. He says, fine, these are important. But why should we care about it? Let the plant management take care of them. And I think the answer to that is that we don't trust them, period. I mean, that's the truth.

MEMBER WALLIS: But the point is to what degree should you interfere with?

MEMBER APOSTOLAKIS: We don't trust them.

MEMBER WALLIS: To what degree should --

MEMBER APOSTOLAKIS: To go down to look at 40,000 different things and check them all?

MEMBER BONACA: I don't think it's a question of trusting. I think it's a question of what requirements do you expect to have implemented. There is always debate about, for example, what requirements do you need to support something.

MEMBER APOSTOLAKIS: There is always a difference in trust.

MEMBER BONACA: And in the debate you have come to an agreement of what is a reasonable approach and then what you do that --

MEMBER APOSTOLAKIS: Absolutely.

MEMBER BONACA: -- becomes what you do.

MEMBER APOSTOLAKIS: That was in Ohio, Davis-Besse. I think there is an issue of trust as well.

MEMBER MAYNARD: I agree with Mario, though. I don't think this is a matter of trust. There are issues you may have specific plants or whatever. It's a matter of what is the regulator's responsibility to the public and the ability to demonstrate that. And it has nothing to do with

trust.

MEMBER SHACK: Yes. I mean we have chosen to make this a regulated industry.

MEMBER MAYNARD: Right. Right.

MEMBER SHACK: And then you have to decide what it is you're going to regulate.

MEMBER POWERS: And Congress said that the NRC will assure. And so NRC's got a job to do just like the plant management does.

CHAIRMAN KRESS: But there is a question of why tie it to the licensing basis events? Because those aren't reality. Why not use importance measures that come out of the PRA and --

MS. DROUIN: Why?

CHAIRMAN KRESS: Huh?

MS. DROUIN: Why?

CHAIRMAN KRESS: But why isn't that the only thing you use? Why go back to the LBEs when that's the important is how they contribute to the actual risk, which is the PRA. Why not just use importance measures and the PRA to decide on the safety significant?

MEMBER POWERS: You don't get enough -- you don't cover all systems.

MEMBER BONACA: Well, the other thing is

that PRA, I mean if you focus on CDF, you know addressing some of the issues. For example, you have an expectation, you told the MOVs which perform during accidents would be tested to demonstrate that they will operate under the conditions at which they are designed to operate. And so therefore, you impose certain requirements on those MOVs even if an MOV only leads you to, say, it's for an AOO, for an anticipated operational occurrence.

I mean so the failure of the MOV to operate, you may have a barrier after that that says well nothing much is happening there, but still is important for this concept of defense-in-depth, for example.

MS. DROUIN: I mean, to me probably the two major differences here that's different than what we're doing today is that, you know, we just have two categories. And don't come up with four categories. And so I think that's a major difference.

Doing that forces -- the reason you had those four categories is because you do have things that people are taking credit for in the PRA. Sorry.

You have things that the PRA is showing risk significant that didn't get labeled safety important, important to safety. But also one of the

reasons some of these plants are as reliable as they are is because they are taking credit for things that aren't showing up as important -- identified as important to safety. And so if they degrade or they aren't maintained, then the risk would not be as low as it is.

MEMBER BONACA: But going back to that statement I made, naturally I am confused now.

For South Texas they have gone through the approach of taking some components which were safety related, and now they're none safety significant. Therefore, they removed. And the criterion they used really was that CDF and -- CDF. And here in this approach, however, you have other goals other than CDF--

MEMBER SHACK: No. They have an integrated process. That's right. 50.69 that is supposed to include considerations of things that I think are -- you hope are built into the LBE decisions here.

MS. DROUIN: Right.

MEMBER BONACA: But they really didn't do that way.

MEMBER SHACK: Well, I don't know exactly what they did, but --

MEMBER MAYNARD: I personally think we

should move more away from the old fashioned safety related. I think it's more important to -- you know, how do you treat the -- what's needed to assure that you have the equipment when you need it? And a lot of these gets to be performance-based. And, again, I get back to the maintenance rule, there's certain surveillance tests and stuff that I think are far more important than what pedigree you may have purchased something or whether you carry it on a Q list or not.

MS. DROUIN: And we agreed with you. And that's what this third bullet is meant to imply, is that we aren't saying that because everything is safety significant that it has to all be the same pedigree. You know, we're just saying okay what are those group of components that we're going to just -- you know, either they need to be monitored, need some pedigree, need something in between, whatever. So we're just trying to capture that group of components, and that group of components is we're saying those have some significance to safety.

MEMBER MAYNARD: But if you credit it in your PRA, you should do something that provides some level of assurance that it's going to have the reliability that your seeing.

MS. DROUIN: That's exactly the approach

we've done here. Now at the end, though, we now use the risk importance measures to determine to what degree do they need to be looked at.

MEMBER POWERS: The trouble I have is that in the South Texas experience by far and away most of the decisions on which box to put things in could not be made from the PRA. They could only be made by this expert panel that they set up. And it was an engineering judgment, and in fact I think a very good engineering judgment because many people would identify a component as, right, that's got to be there and it's got to be high quality, even though it doesn't show up in the PRA.

MR. LEHNER: We do state that you can add SSCs that require special treatment based on engineering judgment, not just on a PRA. In other words, the PRA is not the sole --

MEMBER POWERS: I bet I'd do that all right. If I had a plant, I'd just love to have them on your list. I might put them on my list, but I'm not sure I'd put them on your list voluntarily.

MEMBER WALLIS: Well, PRAs should be a living thing. If you have a valve which is soon to be 95 percent efficient in the PRA and it's allowed to deteriorate to the point it's 50 percent efficient,

there ought to be some mechanism where that is recorded and you have a living PRA that lets you know that you have effected risk profile by letting this valve deteriorate.

MS. DROUIN: Exactly.

MEMBER SHACK: That's usually not the problem, however.

MEMBER WALLIS: That ought to show up. And then you do something -- that's an indication that you should have done something about it.

MS. DROUIN: And that's why we have --

MEMBER WALLIS: Is that what happens here?

MS. DROUIN: Yes.

MEMBER WALLIS: Well then you just need the PRA then. You just need the PRA. You don't need to have a separate category of stuff.

MEMBER POWERS: That's not usually the problem, Graham. The problem is usually that the system is not called upon to perform. You don't know that the valve is degraded because it only gets activated once every plant lifetime.

MS. DROUIN: But just requiring a living PRA doesn't accomplish it. You have to tell them, okay, you got a living PRA. Now you got to require them to go and reassess this. Just before you say

"Hey, I living PRA," you got to tell them what to do with it.

MEMBER WALLIS: But if you have a living PRA -- having a living PRA sort of implies that you are reassessing all the time and the reliability of all your safety systems.

MS. DROUIN: No.

MEMBER POWERS: It doesn't imply that.

MS. DROUIN: It doesn't imply that to me.

MEMBER WALLIS: Well, that's what living PRA means to me.

MS. DROUIN: The living PRA just means that you're maintaining that PRA. It doesn't mean that you're making decisions on what you do with the results of that PRA.

MEMBER WALLIS: Well, the fact that you've assumed a valve has a certain reliability in your PRA is fixed for eternity? The fact that something happens to that valve or it's not maintained --

MS. DROUIN: But it's not fixed for eternity.

MEMBER WALLIS: -- has no effect at all?

MEMBER APOSTOLAKIS: Well, in principle --

MS. DROUIN: You do your PRA on, say, year one, okay. Five years later -- let's just say it's a

five year update they have to do. And you know the reliability of that's changed. And now you've got different rankings coming out. Just because you've done that assessment, where's the requirement that says you have to go do something with that information.

MEMBER APOSTOLAKIS: The maintenance rule forces you to do that, among other places.

MS. DROUIN: Well, that's my point. That's -- you had another rule. Just having a living PRA itself doesn't force you to do something.

MEMBER APOSTOLAKIS: It doesn't do anything.

But I have two questions. One is are we discussing the points you raised earlier? That's what the schedule says, or is a free discussion about --

CHAIRMAN KRESS: Well, we started out the meeting today --

MEMBER APOSTOLAKIS: Okay. But I think we should go back. Because there are some points that you might --

CHAIRMAN KRESS: You're welcome to go in.

MEMBER APOSTOLAKIS: But I an answer, because this question keeps coming up. I mean Graham asked the question what do you tell the public when

they ask you how safe it is. I don't think there is an answer to that. I think the answer is the same that this agency has used for a long time, which you can state in different ways. But if a plant has gone through the process of licensing, then it is safe.

MEMBER WALLIS: Well, how do you get credibility?

MEMBER APOSTOLAKIS: In other words, a safety case has been made. These are the magical words that they use.

MEMBER WALLIS: Trust us. Trust us is --

MEMBER APOSTOLAKIS: Well, it's not just-- well, in a sense, yes.

MEMBER WALLIS: Trust us.

MEMBER APOSTOLAKIS: In a sense. But the safety case is not the result of a single thing. Okay. It's not the result of the PRA. It's not the result of the maintenance rule. It's a number of things. And they're struggling now in the waste, the Yucca Mountain thing, to build safety cases where they actually use those words.

But for me, I'll take an example. The ESBWR. You go and you look at the PRA. They did it so the core damage frequency -- now does anybody believe that? Has anybody come up with --

MEMBER POWERS: Yes, right.

MEMBER APOSTOLAKIS: -- a counter argument, for example, they assume a probability or a reliability of unity for all the passive systems. So people say well this can't be true, but nobody can come up with an argument why it cannot. But then they do the focused PRA, they take out all the active safety systems and they still get, I don't know, ten to the minus five. Then they assume a few other things. You know, sensitive studies. In my mind this builds the safety case.

In other words, I really don't what the core damage frequency is, maybe it's not three times to the minus eight. But I know it's not three times to the minus four. Because I have seen all these analysis and I know that they're also doing other things, regulatory requirements and so on.

So the final answer is yes, that -- if you ask me is it safer than existing reactors? I would say yes. How much safer? I can't tell you. But I think it's safer, because I've seen all these studies.

So the answer is never a number. It's the result of all these analyses, regulations, defense-in-depth, meeting defense-in-depth requirements. And I think we have to recognize it.

Now, the old saying was if it meets our regulations, it's safe. Sort of cyclical there. But there is a hell of a lot of truth in that.

MEMBER POWERS: Well, that sounds like--

MEMBER APOSTOLAKIS: If it meets our regulations, it's safe.

MEMBER POWERS: To be precise is that we presume that it provides adequate public protection.

MEMBER APOSTOLAKIS: Right. Right. There is a presumption which means we allow it to operate.

MEMBER WALLIS: But then any place can say that. I mean, the former Soviet Union said exactly the same thing.

MEMBER APOSTOLAKIS: Right. So you really have to look at what makes up the safety case. And it seems to me with risk we have increased the knowledge base. But it's always a safety case. It's never a single thing.

MEMBER MAYNARD: I think it goes beyond just saying it meets regulations. I think our process is open to the public for public scrutiny for how did the rules get developed. And there's a lot more that goes behind the regulations.

MEMBER APOSTOLAKIS: Sure.

MEMBER MAYNARD: The margins that are

required to be in various areas and stuff. So I think it's more than just a trust me it meets the regulations.

MEMBER APOSTOLAKIS: No. But at the end, though, Otto, you're saying trust me. I have made the judgment. I mean that's the truth of it.

MEMBER WALLIS: Trust me because NRC --

MEMBER APOSTOLAKIS: I took all these things into account and I declare, you know --

MEMBER POWERS: The gold standard.

MS. DROUIN: Right. But if you did not say that the regulations provided for adequate protection, then what's the basis for --

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: -- granting them a license?

MEMBER APOSTOLAKIS: Right. Right.

MS. DROUIN: Because you're not adequately protecting the public.

MEMBER WALLIS: Well, when I go in for surgery and I've talked to a good surgeon, he doesn't say trust me.

MEMBER APOSTOLAKIS: Oh, he does.

MEMBER POWERS: Yes, he does.

(All speak at once).

MEMBER APOSTOLAKIS: He's so elegant, he's

not even certain of that.

MS. DROUIN: He didn't even ask a question.

MEMBER POWERS: He's so arrogant, he doesn't even ask you.

MEMBER WALLIS: Well, the last time I had surgery, I had a very good discussion with the guy about the possibilities of this and that and so on. And he sounded as if he understood these things. He didn't say trust me.

MEMBER APOSTOLAKIS: It's presumed.

MEMBER POWERS: Come on.

MEMBER WALLIS: Anyway --

MEMBER SHACK: You have a better doctor than I have. Mine just stares at me and says trust me.

MEMBER MAYNARD: They all make legal disclaimers now in fact that something could go wrong.

MEMBER BONACA: Actually, a PRA could be good also in medicine. I mean, you could ask them to perform a PRA.

MEMBER POWERS: No. There's too much error of commission.

MEMBER CORRADINI: So I want to know, Mr. Chairman, where are we in this -- yes, where are we

here.

MS. DROUIN: I request that we take a break.

CHAIRMAN KRESS: We're at a break time. And then we're going to come back and maybe talk a little more about design stage versus operational stage. It's on the agenda. I don't know what it means.

MS. DROUIN: We are on the technical acceptability.

CHAIRMAN KRESS: Okay.

MEMBER APOSTOLAKIS: I really would like to --

CHAIRMAN KRESS: Yes, go ahead.

MEMBER APOSTOLAKIS: I'd like to also hear the comments that you received in your response. I mean, you summarized it earlier, but I mean there is a response -- no the comments. I really want to know whether other people raised the important --

MEMBER POWERS: I couldn't give a damn. I don't care.

MEMBER APOSTOLAKIS: Well, I do.

MS. DROUIN: Okay. Let me just answer, we have not gone through and finished doing that. So we're not beyond what I told you this morning in those

viewgraphs in terms of the detailed comments on all the technical issues. We're still sorting through that. You know, the only comments that we've been able to sort through and summarize are the ones that dealt with the issues we brought up this morning. We have not done yet, we are not finished with what you're asking for, George.

MEMBER APOSTOLAKIS: We will write our letter May?

CHAIRMAN KRESS: I don't recall what the-- we have on this month's agenda.

DESIGNATED FEDERAL OFFICIAL FISCHER: Just to remind the Committee what the purpose of the meeting was supposed to be, we're supposed to be able to respond to an SRM item that came out your meeting with the Commission in October. And the SECY suspense date is end of May. And the task is to provide the Commission with your views with respect to the staff's work on the technology-neutral framework with a focus on ensuring the value of such an approach versus the development of a licensing framework for specific designs, such as high temperature gas cooled reactor or a liquid metal cooled reactor. That's the task.

This relates in an abstract sense to that, but we need really to focus on which is the best

strategy to moving forward. And I think the closest we came to that today was when Stu was talking. But we need to focus on the different options and the pros and cons so that we can articulate to the Commission why we're proposing what you guys would like to propose.

MEMBER WALLIS: We haven't heard that at all.

MEMBER APOSTOLAKIS: When is the letter due, though.

DESIGNATED FEDERAL OFFICIAL FISCHER: The letter is due May 31st.

MEMBER APOSTOLAKIS: And what is the plan now? To write it at the May Committee, their meeting?

DESIGNATED FEDERAL OFFICIAL FISCHER: Tom drafted up a letter that we can use as a starting point. I don't think -- well, we are required to respond until May 31st.

We do have plans to talk with the staff about the SECY paper that they're planning to send forward to the Commission with their recommendation on how to proceed. And that's supposed to happen in May.

And one of the things I put int he status report was you guys may want to wait until you've had the benefit of that presentation before you formally

respond to this SRM item. But it would be nice if we were working on the response to this SRM item between now and May.

MEMBER APOSTOLAKIS: So what you're saying is that today's meeting did not address the real question?

DESIGNATED FEDERAL OFFICIAL FISCHER: No, it does.

CHAIRMAN KRESS: It's information that you can use to make your judgments.

MS. DROUIN: We did go through before you came in, George, if you go back to viewgraph --

MEMBER APOSTOLAKIS: Somehow, whenever I'm late, all the important issues are discussed before I come in.

MEMBER POWERS: Well, you were very late, George. But what's surprising, George, is how quickly we moved through them.

MS. DROUIN: But in terms of, you know we did not -- because we're still sorting through the details on the technical stuff, but in terms of the merits, you know, moving forward in the framework, we did give you a summary of that, which were these slides here. Going through whether we should have this Part 53. You know, here was kind of a summary of

the comments. I mean, they were generally supportive about moving forward. I'm going to put generally supportive, because it's kind of hard to separate some of these things out because they're so interrelated. You know, whether it should be technology-neutral, technology-specific. You know, there was a mixture of use there.

MEMBER APOSTOLAKIS: Oh, this is like an ACRS discussion.

MS. DROUIN: I can't give you what wasn't said. This is what was said and the -- you know, whether or not we should go to rulemaking, the general consensus from all the comment was don't go to rulemaking right away. It's premature. You know test some things out. Develop some implementing guidance. Do some pilots. You know, I mean they all characterized it in a different way, but it was generally don't do it right now. Don't even not do it, just don't do it right now.

MEMBER WALLIS: Well, to get back to Dave's question, I mean I can't imagine licensing new reactors without something like this framework to decide what to do. You can't just say we're going to license this thing without some structure like this.

MS. DROUIN: Well, and I think that's what

we heard from the public.

MEMBER WALLIS: No matter what.

MS. DROUIN: Just don't make it a rulemaking.

MEMBER WALLIS: So I don't understand what the alternative is. What's the alternative?

MS. DROUIN: Work some of this out.

MEMBER POWERS: Well now what you're telling me is that we could not have licensed Fort St. Vrain.

MEMBER CORRADINI: No, he didn't. He's saying we didn't license Fort St. Vrain.

CHAIRMAN KRESS: No, we did.

MEMBER CORRADINI: I know we did.

MEMBER POWERS: We could not have certified the FFTF Clinch Rover. But Clinch River never really got done.

MEMBER WALLIS: We have to have some basis. We have to have some basis.

MS. DROUIN: I think there's really just one question on the table. Because the question is if you do it under -- right now if you're going to license something it's going to be under Part 50. The question is are you going to approach this given exemptions and additions with a deterministic hat on,

so to speak?

MEMBER SHACK: This Committee?

MS. DROUIN: Are you going to do Part 50 using more and allowing them to use a probabilistic approach? So I mean to me that's the fundamental question.

MEMBER APOSTOLAKIS: No. Because even when the rule is deterministic, this information is used. So you're just formalizing it a little better. But the truth of the matter is that there is a mixture, the basis is deterministic and I think that's the way it's going to be for the foreseeable future.

MEMBER WALLIS: The question, George --

MS. DROUIN: But you've already made the decision it's risk-informed.

MEMBER APOSTOLAKIS: Which one?

MS. DROUIN: You've made the decision it's risk-informed?

MEMBER APOSTOLAKIS: Yes. Yes.

MEMBER POWERS: And it can't be, and I agree with him on that. And the question is where is the balance?

MEMBER APOSTOLAKIS: Yes, where is the balance?

MEMBER POWERS: We see in license and

power uprates --

MEMBER APOSTOLAKIS: Yes, exactly.

MEMBER POWERS: There is no risk at all.

MEMBER APOSTOLAKIS: The rule is deterministic, and yet there is always someone -- presented our distinguished our guests here.

MEMBER POWERS: And actually in power uprates it's worse than that. Not only is there not any risk, that that is risk is the wrong risk to apply because it's core damage frequency and it doesn't really change.

MEMBER APOSTOLAKIS: That's right.

CHAIRMAN KRESS: I think we're at a part where we need to take a break.

MEMBER APOSTOLAKIS: Yes.

CHAIRMAN KRESS: We'll come back and decide on what to talk about.

Are we on the agenda for the full Committee?

DESIGNATED FEDERAL OFFICIAL FISCHER: Yes, we are.

CHAIRMAN KRESS: It may just be a blank spot. But we need to decide.

(Whereupon, at 3:05 p.m. a recess until 3.26 p.m.)

CHAIRMAN KRESS: We're ready to get started again.

Where are we, Mary, do you know?

MS. DROUIN: I've not a clue. We're at the end, and everybody's happy. Did I sell that?

CHAIRMAN KRESS: Is there anything else you want to talk about right now or anything Members think we haven't touched on enough yet and want to bring up.

George is not here.

MEMBER CORRADINI: The two aren't here.

MEMBER MAYNARD: Well, I do think it would be worthwhile to talk a little bit about why this approach and not technology-specific, since that's one of the questions that we really got to answer. And I don't know, maybe they've covered that.

CHAIRMAN KRESS: You wanted to say a few words about that, Mary?

MS. DROUIN: Yes. I'll try to just give you what our vision was.

MEMBER CORRADINI: Can I broaden his question, though?

MS. DROUIN: Absolutely.

MEMBER CORRADINI: All right. Because my only thing is I had missed this part, but about what

is going to be carried forward. It seems to me I'm back to the empiricism of testing it. And you said you tested it with the ALWR with a particular plant. I'm thinking of --

MS. DROUIN: No, a light water reactor.

MEMBER CORRADINI: Right. I'm sorry. A light water reactor. Excuse me.

But I think going on what with Otto was saying is it seems to me the next thing up is the NGNP. It would seem logical to somehow flush this out and the practicalities of it relative to that, and it's a new plant. And simultaneously I would expect, and so my question is, can this be done in parallel? Because I get the impression it will be more empirical and more historically based on how the NGNP may proceed forward. But if this would be carried along and flushed out along that way, would that not be of benefit to you? That's kind of my part of the question.

MS. DROUIN: Okay.

MR. MONNINGER: This is John Monninger from the staff within our Research.

And I think one things that is important to recognize here is we have with the help of the Committee, the ACRS, you know stakeholders out there

have been developing the framework for several years. And in any project as the project goes on you're able to address certain issues within a certain amount of time with a certain level of effort. And then you have more difficult issues and you're not quite sure what direction to pursue on some of these issues. And so there is a thought, you know we haven't reached any firm conclusions, there is a thought though that we have made significant progress with the framework. And the question is where do we take the framework from here forwards.

Do we keep to pursuing these issues on a technology-neutral basis without any specific applications in front of us, without any specific designs? Is there some way we could facilitate resolution of these issues in a more productive manner?

I guess at the same time we recognize that within the staff we are working with DOE in development of this NGNP licensing strategy. At the same time we're having interactions with PBMR on the white papers. At the same time you have the GNEP program. So whereas at one time when we were working this, those three other programs weren't in place. Now we recognize that there are these other programs that

the framework could potentially contribute to.

So you know the potential notion is should we pursue more these other programs and see to what extent the framework could contribute to those programs? So that's what the thinking is currently. It hasn't been vetted totally throughout, but at one time it was just the framework and now we have other projects to develop, licensing strategies coming on at the same time. I mean, do you really want to run down three paths at the same time? Do you want to be developing the NGNP licensing strategy, pursuing the framework and at the same doing something for GNEP? You know, shouldn't there be something that is the lead runner there and that some of these programs somehow dovetail together.

We also have a high temperature gas reactor research plan. And in there there's -- you know. So I think what is happening is we're recognizing that there is a need out there to define a path forward and we're trying to pull these programs together.

Does that make sense?

MS. DROUIN: And adding on to that, I think we got to go back and visit history a little bit. You know, why was this program implemented and

where were we trying to take it? And where we were trying to take first is where we are now, and John hit very well on those things, is now do we have to change part of it because where we thought we trying to go and how you use this framework. And I really want to emphasize the word "how."

I mean if we go back to 2003, you know there was the recognition of all these policy issues for advanced light water reactors. You know, the policy issues on how do we address enhanced safety? How do we deal with defense-in-depth? Probabilistic approach to the licensing basis? Source term, mechanistic source term? I'm missing three more. But you know there was a whole catalogue of these policy issues that move forward as we start looking to the future for advanced reactors. And in doing that we said, okay, and the Commission came back and told us to move forward with five of them. And in trying to deal with these policy issues, you know, we had also said that it made more sense to create this new -- we called it a Part 53 for just lack of a better word. Would be to create a new regulatory structure for licensing these advance non-LWRs. You know, it just didn't seem to be efficient. Not that you couldn't do it under Part 50, because you could. But it just

seemed to be more efficient and more effective and you would get to being able to maintain stability, produce stability under this new regulatory structure for these advance non-LWRs than this old one.

So that's kind of where we went off was, okay, now to create this document, this framework that would be used as the technical basis for this new Part 53. We had thought out at the time in laying out the ground rules, because we had a lot of ground rules in places where we trying -- and that's all documented in all this stuff.

I've got another whole book that's like that thick of all the SECY papers and things that have been created over the last 3½ years. But in doing that one of the complaints or problems that we went back and looked at the current Part 50 and in risk informing it. Also that over time as we became more knowledgeable and while a rule was written at the time made sense based on the knowledge we had at that time, that as we got more knowledge and wanted to refine a rule, it make it more difficult because you were dealing in rule space.

So since we were going into an arena of reactors that we knew less about, the premise was that if we could create these rules as best we could to the

same scope and depth of the current but try and keep them more neutral so that as we gained more knowledge, that we wouldn't have to go back into a rulemaking to bring that new knowledge into the regulatory structure. We would get those specifics in regulatory guides. And so as we gained more stuff we would be changing regulatory guides and not rules.

So that was kind of a vision of where we were trying to go with all this. Personally, I don't think that's been a difficult challenge. The challenge has been, you know, bring in this probabilistic approach form the very beginning, you know, starting with a clean sheet of paper, integrating risk from the ground up.

And to me today's a good example that's where the challenge is. We've been all over the place in trying to come to grips. And I'll tell you over the last 3½ years that frequency consequence curve has been all over the place.

CHAIRMAN KRESS: It seems to me like the ACRS in his SRM that it's been charged with answering has been given two options. And I don't like either one of them.

One option is stop work on the framework and instead -- I mean it's really one option. Which

of these you want? Stop work on the framework and go to a specific application or I think -- they want our opinion on that. And it seems to me like do you have to? Can't you do both? I mean are we so limited in resources that we can't go to a specific application, and continue working on this framework until we got it really the way we wanted it?

MS. DROUIN: Well, I think the problem is semantics here. And do you stop where you are here? The answer is a yes and a no. I think we can publish this document the way it is.

CHAIRMAN KRESS: I wouldn't.

MS. DROUIN: Now --

CHAIRMAN KRESS: I would recommend against that.

MS. DROUIN: I'm sorry?

CHAIRMAN KRESS: I would recommend against that because I think you need a little bit of polishing and a few items that you need to straighten out.

MS. DROUIN: Yes.

CHAIRMAN KRESS: But, you know, it's not far. You're close.

MS. DROUIN: I think we're very close. But I think what we should be doing next is trying to vet

these issues out now and how you actually apply them and use them. And, you know, if you go back. I don't know if you remember that famous figure. At one time we had this figure that shows that this whole thing was this four phased program. And the first phase was to develop the framework. The second phase was to show an example set of requirements. We've done that. The next phase was to develop an implementing guidance document of how you take this and implement it. And then the next phase was bringing all of this together and go to rulemaking.

Now, where we are and what the stakeholder comments have said it's premature to go to rulemaking. I don't disagree with that.

CHAIRMAN KRESS: Yes, I don't disagree with that.

MS. DROUIN: Because I think that second phase, or the third phase -- I can't remember what number it was, which was to develop the implementing guidance document. And that's where it really gets into the details of this stuff.

You know, the details that you all are looking for are correct, but they aren't meant to be in this document. They're meant to be in the implementing document, which we have not started. I

think we ought to go to that one. And in doing it, you know, take a real plant design, whether the BMR or whatever. Now then you can take that and say, okay, if that's working, and I don't think that's years of effort. I think that can be done in a year.

CHAIRMAN KRESS: Yes.

MS. DROUIN: And then you take that and say now does it make sense if it turns out that it's working and we're able to work all these issues out, then do we develop a regulatory guide to support licensing these things under Part 50 using the concepts from the framework?

MEMBER WALLIS: Well, to apply to the SRM, I think you'd have to look at what would happen if you applied this framework to, say, the BMR. What would happen if you tried to do it without this framework? You might well find that when you try to do it without the framework you're forced to do many of the same things.

MS. DROUIN: Absolutely.

MEMBER WALLIS: Which would be really reenforcing your framework.

MEMBER MAYNARD: Yes. I think the way the Commission posed the question to us shows a different understanding of what the purpose of the technology-

neutral framework is all about. I kind of get the impression they think that you either issue a rule for each specific design or you issue a rule for technology-neutral, that that rule itself would license any type of plant. And that's really not the case.

The technology-neutral framework is going to be a process, whether you use the existing regulations and use this process for where you take exception, or whether you develop different rules for each technology, it's the framework by which you start making the decisions. So I don't see it as one of where you stop one to do the other or vice versa. I think it's an important framework and it's going to be used whether additional rules are developed later or whether you use it for exemptions to the current rules as a process.

CHAIRMAN KRESS: I agree.

MEMBER MAYNARD: You're not going to license any plant under this framework. It's not going to come out with a set parameters that you submit something and say "I meet it, and therefore I should get my license."

MS. DROUIN: Well, I agree and disagree with what you said. I agree in the sense that the

circumstances have changed. I do think that the Commission was asking based on the history and all the communication that we've had in the SECY papers. And they've been very detailed and I think very -- I don't think there's been misunderstanding. And I think the Commission was asking very specifically should we develop this Part 53. You know, because that's always been where we've been going. And if you go back and you read the whole series of SECY papers, I think that's where they were asking. And that's why they wanted us to go and do this ANPR, should we be developing this Part 53 and should it be technology-neutral, or if we do develop this new Part 53, should we go specifically and make it specific to a reactor technology.

Now my personal opinion is I don't think you need to go to technology-specific. You certainly could. There's no reason you have to do a technology-neutral.

I mean my personal recommendation is going back of why we wanted to go technology-neutral is because we are going to learn more things and to go back to change rules is a very tedious process. We're dealing with that right now in risk informing Part 50, and it's very tedious. Whereas if the details can be

regulatory guides and you're regulatory guides in the future. So our vision always was to have the regulations neutral and have the details, the technology specific details in regulatory guides.

Now people have said oh well that's not a requirement. That is a requirement. That's part of your license. But it is easier to change a regulatory guide than a rule.

MEMBER CORRADINI: I guess I'm reading the words that we were -- I guess we're kind of still talking about the framework but also talking about the SRM and what we're somehow tasked to do, come hell or high water.

In reading the quote they really do say "verses." And I guess I would dodge --

CHAIRMAN KRESS: Yes, that's the word.

MEMBER CORRADINI: I would dodge the charge in the sense that I think that the framework can be neutral, but the application will never be neutral, right? I mean --

MS. DROUIN: What do you mean by application?

MEMBER CORRADINI: Hang on there. Well, the application is because you got a reactor and it's cooled by gas, and it's got a lot of graphite. And

there's certain characteristic accidents that you got to worry about. And the application of the technology-neutral framework to this specific design or design class will be specific. You're going to have to get into the nitty-gritty.

MS. DROUIN: Absolutely. But that application can be that the regulation is neutral. The regulatory guidance is specific. The combination is technology-neutral.

MEMBER CORRADINI: Okay. I hear you. I'm not sure in the time frame if I believe that the EPAC 2005 relative to NGNP if a neutral regulation can be promulgated, vetted, agreed upon, blessed and instituted before they start down their path.

So putting that aside, I guess the reason I'm saying this is more not towards you guys, but really towards our action item is I guess I'd dodge it and basically recommend what you guys have been kind of going along, which is we got to continue with the development of the framework because this is the philosophical underpinning, but I would apply it in a pragmatic way with the current rules. Because I don't see how we have any choice given the time frame.

CHAIRMAN KRESS: Yes, I think that's the kind of a position I would come down on it. And I

think Mary agrees with it.

MS. DROUIN: And I agree with that.

CHAIRMAN KRESS: Yes. Okay.

Yes, I think that's kind of going to be our tentative answer to that.

MS. DROUIN: But this is where I think it's a matter of semantics. When I talk about framework, I'm talking about NUREG-1860.

CHAIRMAN KRESS: Yes, I understand. Yes.

MS. DROUIN: Minor polishing, but it's a new document that you're creating when I talk about this implementing guidance document a lot of these issues out. And it's that guidance document, you know maybe with a regulatory guide that would support the current Part 50.

CHAIRMAN KRESS: Yews. I think that's needed, too.

MS. DROUIN: And I think when you use the word "framework," I think you need to be careful whether you mean it in this big global sense or whether you mean NUREG-1860.

CHAIRMAN KRESS: Well --

MS. DROUIN: Some people interpret that word "framework" to mean 1860 and some people mean it in a broader sense.

CHAIRMAN KRESS: Well, I like to interpret it as being 1860.

MEMBER BONACA: Yes, me, too.

CHAIRMAN KRESS: But I think it's important that you have this implementation guidance.

MS. DROUIN: I don't disagree.

CHAIRMAN KRESS: So what I would like to see is I don't think you're quite ready to publish 1860 the way it is. I think it needs a little bit more work. But it's awfully close. And then publish that and at the same time be working on the implementation guidance. I'm not sure for which specific design, but I would probably chose the PBMR because I think you have all of the relevant inputs for that right now through the white papers and the PRAs and stuff. I think it would be an easier implementation guidance to do.

MS. DROUIN: Yes. I don't know how to respond to your statement, Tom. I don't disagree with you. I mean, all I can share with you at this time is that the plan is to publish this summer.

Now, does that mean that it couldn't get some polishing more done to it to address it? Yes, it could. Have we budgeted for that? Right now, no.

CHAIRMAN KRESS: Well, I think the key --

MS. DROUIN: Could that change? Yes.

CHAIRMAN KRESS: In my mind the key missing ingredient is a final risk acceptance criteria for design. That shouldn't take much to put that in. And I think that's LC curve, a CCDF. And without that, I don't think you have a complete document.

MS. DROUIN: Yes. I don't think to address the concerns that I've heard today is difficult.

CHAIRMAN KRESS: I don't either, frankly.

MS. DROUIN: I don't think it is.

CHAIRMAN KRESS: I saw saving points.

MS. DROUIN: I really don't. But all I know is what I have in terms of the budget in terms of getting this published. And what's in my budget is to do tech editing at this point. Now is it a lot more money to do what you want to do? No. But, you know, I can't squeeze, what is it, blood out of a turnip or whatever the saying is?

MEMBER CORRADINI: Water out of the stone.

MS. DROUIN: That, too.

CHAIRMAN KRESS: How do we get you more budget? I got a quarter I could --

MS. DROUIN: Talk to Mr. Monninger. I will put him on the spot and I shouldn't do that. Because he's very supportive of this.

CHAIRMAN KRESS: I mean, this framework is so important for having what I would call coherence in the whole regulatory system, not just new plants. And it's so important for the future certification of any kind of design that I think it's going to be foolish to not make this framework document as complete as possible and make it a really good document that you want to serve the purpose. And I think you're close. I think it would be crazy to stop now.

MEMBER BONACA: Because it seems to me also that you know on the implementation document, this is a repository of a lot of thinking --

CHAIRMAN KRESS: It's a repository of the whole concept.

MEMBER BONACA: -- which is consistent with the whole position to reach -- so I don't think anybody who was going to design a new plant would ignore it. In fact, they will pay a lot of attention to it.

CHAIRMAN KRESS: That's right.

MEMBER BONACA: You know, even if you don't have a requirement or an implementation document. Just because they know which the NRC is going to think in terms of licensing a new plant. You

know, it's an important document.

CHAIRMAN KRESS: It's too important of a document I think to quit work on right now.

MS. DROUIN: I don't disagree, but I'm not the one that makes that decision.

CHAIRMAN KRESS: Well, at least we can pass on what we think to the Commissioners. You know, I can't speak for the Committee. Maybe the rest of the Committee doesn't agree with me.

MEMBER POWERS: Tom, what we know from experience that license several reactors, Peach Bottom 1 were done in a previous era -- CRS really did them. The ones we know about are Port St. Vrain and the certification of FFTF. And what we know that things were very ad hoc there. And that decisions had to be made. They were made by individuals, they were justified by individuals. In any agency there's a lot of oversight in that. So it wasn't really a completely capricious sort of thing, but they were still very ad hoc.

And without a document like this you're going to continue that really ad hoc fashion. And I'm not sure that the Commission really wants to face the public confusion that would come about from an ad hoc kind of approach. And I think we have to impress upon

them that, yes, maybe time schedules are pressing on them. You know, but there's always time to do things over, there's never time to do it right.

CHAIRMAN KRESS: Yes.

MEMBER POWERS: And that just can't be their situation here. You just got to go ahead and finish this thing up and then go ahead and pursue it. And I don't think I would devote a whole huge amount of time to testing it against particular plants. I would go to driving it forward to completion.

CHAIRMAN KRESS: Yes, I couldn't agree more.

MEMBER POWERS: And extension on and whatnot.

I agree with you, let's go ahead and publish it. I would do it with just the editing because you're going to revise it as you get into things anyway. And every time you do something in connection with this risk=informed application you're going to learn something and become smarter, and you're going to go back and iterate. It's not going to be a straight line process.

MS. DROUIN: Right. And I mean I think that in terms of polishing it, I think that polishing can take place in the implementing guidance of it. I

don't think it has to actually appear, you know, like adding -- not everything has to appear necessarily in that document. That can be an outcome of implementing it that we need that curve in there.

MEMBER APOSTOLAKIS: I think we should polish it as we polish any document that is issued by this agency. And I agree that it will be polished as you try to apply it. But if you know how to polish it now, you can polish it now.

We always try to issue --

MS. DROUIN: So I can send you the bill?

CHAIRMAN KRESS: Yes, sure.

MEMBER POWERS: I'll tell you what we do with bills from the Government. MIT is so wealthy with its endowment, they can probably cover the whole thing and not even -- just out of their coffee fund.

MEMBER WALLIS: Well, if you're going to polish it, and this --

MEMBER APOSTOLAKIS: No. I mean this is your polishing. But anyway, sorry. Go on.

MEMBER WALLIS: That's fine, George. I think polishing is fine. But I think that it's not to the point where there aren't going to be ways to improve it. And I agree with Dana that we need something rather than an ad hoc approach to all these

future plants. This is a first draft. It's a good thing. I think there are ways to improve it and that's why I'm concerned about this decision to stop work.

MEMBER APOSTOLAKIS: I am, too, yes.

MEMBER WALLIS: As if it's finished. This is it. The Commission should be told that this is a great first step. There's some good ideas here. It's going to save a lot of work down the road, but that there will probably be revisions to it.

MEMBER APOSTOLAKIS: I see there is a problem here, though. Because usually when the agency proposes a new way of doing business, there is always a pilot or two. I don't know how you can have a pilot here because you can't use a real application, right? And how else can you get a pilot? I mean I don't see--

CHAIRMAN KRESS: You know they kind of had a pilot in the appendix with the LWR. To me they tested the thing out and said with an LWR in the appendix and said we arrive at this same place or we arrive somewhere different. And I think that was a good test. I don't think you need --

MEMBER APOSTOLAKIS: No, but you really need a future design, that's when the real issues would be. I mean, in existing LWR --

CHAIRMAN KRESS: Yes. But the question is that's not a pilot. You're going to go to a future design, you're going to -- there's no doubt you can implement this. I don't see any reason why not. And you're going to come up a design basis, license basis event. You can do everything that's in there, but what have we found out?

MEMBER APOSTOLAKIS: I think you're going to have issues --

MEMBER WALLIS: Why do you do a pilot--

MEMBER APOSTOLAKIS: --the same way you had the issues when we looked at special treatment requirements and so on. The industry comes back and they try to apply it, and they have comments. And the staff gets comments. And there is nothing special about this that you will not have any issues like that. I mean, that's what you do. That's how you learn.

CHAIRMAN KRESS: But I think the only chance of doing that is the BMR.

MEMBER APOSTOLAKIS: No. Because it will be a real application.

CHAIRMAN KRESS: BMRs aren't real? I mean, they --

MEMBER APOSTOLAKIS: Because it's real, it

cannot be a pilot.

CHAIRMAN KRESS: They'll come in with the license application --

MS. DROUIN: Let's talk about the word "test" versus the word "pilot." You know, testing, you're just testing something in terms of kind of looking at feasibility. To me when you use a pilot and if we look at 50.69 for example, that was a real application that was piloted under that rule.

MEMBER APOSTOLAKIS: Okay. Tell me how you would get your test.

MS. DROUIN: So --

MEMBER APOSTOLAKIS: There is no way.

MS. DROUIN: -- here the problem is you certainly can't pilot it against the 53 because the 53 hasn't been written.

Now you could pilot in terms of writing the new rule if you wanted to license this under a new -- I mean, I can't see anybody jumping up and volunteering that. So then the question is do you pilot it in developing regulatory guide to support licensing under Part 50.

MEMBER ABDEL-KHALIK: Correct.

MS. DROUIN: And that could be a real pilot with a real plant. It's no different, and I'll

use something, I'll use Reg. Guide 1.200. We issued 1.200, then we had pilots come in with real applications under which we piloted and tested 1.200.

MEMBER APOSTOLAKIS: My point is that these are all very different from what you're trying to do here. If somebody has a design and they come here requesting a license, they want decisions.

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: 1.200 we will go and review the PRA. Sure, do it. Let's do it, you know. We find things. We have a nice meeting in San Diego. It's not the same thing.

MS. DROUIN: George, I'm just talking about the process. You can pilot something with a real application.

MEMBER APOSTOLAKIS: And my point is that in this case getting that real application will be very hard just to test the framework. Very hard.

MS. DROUIN: I think that I don't see someone volunteering to do it. Not that it can't be done.

MEMBER APOSTOLAKIS: Oh, of course it can be done.

MS. DROUIN: I'm not saying it can't be done. It can be done.

MEMBER APOSTOLAKIS: Well, of course it can.

MS. DROUIN: I don't see someone volunteering because it's going to extend the time. It's going to make it more costly and will int he long term, will that save them something? I don't know.

We can put Ed Burns on the spot.

MEMBER APOSTOLAKIS: The infamous regulatory instability.

CHAIRMAN KRESS: Well, he wants to make some comments. Let's hear what he has to say.

MR. RUBEN: And Ed can follow me up if he likes.

One of the things that I've been involved also is in the PBMR pre-application review of the white papers. And the white papers as a collection in a way is the risk-derived approach to adopting Part 50. So there are many of the same kinds of issues and they have their approach. And they have piloted that with our design, okay.

We could take our technology-neutral framework approach and walk in the footsteps with our design and their PRA and see what we would come up with in the way of design basis accidents, safety related systems, defense-in-depth. It would be a

comparison. It would be a comparative analysis of the framework and our framework.

CHAIRMAN KRESS: And I think you could almost do that right away, and I think that would be a good choice.

MS. DROUIN: Yes, we could.

MEMBER APOSTOLAKIS: But is anybody --

MS. DROUIN: But that is separate from the review of the PBMR.

CHAIRMAN KRESS: Sure.

MEMBER APOSTOLAKIS: Right. And is anybody willing to fund this?

CHAIRMAN KRESS: Ah.

MEMBER APOSTOLAKIS: I agree, this would be the best way to --

CHAIRMAN KRESS: It has to be funded by NRC.

MS. DROUIN: Well, I thought you were sending the bill to MIT.

MEMBER APOSTOLAKIS: Sorry? We will fund it?

MS. DROUIN: Well, yes.

MEMBER APOSTOLAKIS: I'll propose that, yes.

No, actually, this is an excellent

opportunity. Because the PBMR people have --

MS. DROUIN: Absolutely.

MEMBER APOSTOLAKIS: -- submitted these white papers, it gives you an opportunity to do this, to test your methodology without really having the pressure of an actual application.

CHAIRMAN KRESS: Yes. That's what I was saying.

MEMBER APOSTOLAKIS: But you will need some funds to do this.

CHAIRMAN KRESS: That's right.

MEMBER APOSTOLAKIS: You told us that you are all stopping activity. So that worries me.

CHAIRMAN KRESS: Yes.

MEMBER WALLIS: I think there's another problem --

MEMBER APOSTOLAKIS: Can we recommend that?

CHAIRMAN KRESS: We can. We can do all sorts of things. Nobody has to listen to us.

MEMBER APOSTOLAKIS: It won't be the first time.

MEMBER WALLIS: The framework isn't just advice for the agency about how to license. It really is advice for designers about how to design. Because

you've got all the requirements in here which they have to meet by their design. So it's rather difficult to apply it to a design which is being produced without knowing what the framework was going to be. In way --

MEMBER APOSTOLAKIS: Well, the framework has been in various guises, has been now for years now, right, Mary? It's not that we developed --

MEMBER WALLIS: Do you think the PBMR are being designed in order to meet a framework like this?

MS. DROUIN: Well, remember -- remember --

MEMBER APOSTOLAKIS: But they knew. They knew it existed.

MEMBER WALLIS: If that's the case, then maybe you can do it.

MS. DROUIN: Remember the framework indirectly does help licensees. But the framework is the process, the guidelines and criteria for writing these regulations. Okay.

Now we have -- you don't have a copy of it, but it was our plan to put this appendix into the summer version. We have turned the crank and we have taken our first shot at applying the framework for a complete set of requirements that would we ultimately move to rulemaking, this would be with the Part 53.

So that's what we would be testing, you know, looking at this, how does this fit in in terms of using that to -- if you're going to be licensed under Part 50, well then how does this look to Part 50 and this would serve as a technical basis for making your decisions of, yes, these ruling -- Part 50 applies. These are the exemptions and this is what you need to be doing in addition using a probabilistic approach.

MEMBER APOSTOLAKIS: A related thing. I understand that the staff will not issue an SER or the white papers. Is this Committee going to become aware of what the papers are and what your judgment is and maybe give you some --

CHAIRMAN KRESS: I think we can -- they're not proprietary. I think you can get copies of them.

MEMBER APOSTOLAKIS: No. But I mean in a more formal setting.

CHAIRMAN KRESS: That's a good question.

MR. RUBEN: Well, I'm not the project manager, but I do believe that we will develop our preliminary evaluation, our assessment of what we think is the right track where we think changes perhaps to be made and will become before this Committee would be my expectation with those results.

I'm sure you would have the opportunity to

read the white papers and our assessment before we ever met.

MEMBER APOSTOLAKIS: I think we have seen already on some of this stuff that you guys are receiving. But it would be nice to have a discussion.

MR. RUBEN: Yes. Right now we're in the process as a team to review the white papers, developing our requests for additional information. And I expect we'll be meeting with PBMR --

MEMBER APOSTOLAKIS: Is this kind of unusual, Stu? Why did they submit those white papers?

MR. RUBEN: Why? Because they informed us that they wanted to submit a design certification application 2008 for the PBMR. In advance of that they want us to look at our approach, the use of PRA to develop their licensing basis.

MEMBER APOSTOLAKIS: Right.

MR. RUBEN: So they put together our safety analysis report reasonably well.

DESIGNATED FEDERAL OFFICIAL FISCHER: There is a brief paragraph in the status report on page 4.

MEMBER APOSTOLAKIS: Right. I read it. I think it was very well written.

DESIGNATED FEDERAL OFFICIAL FISCHER: That

must have been by someone else, George.

CHAIRMAN KRESS: Okay. I think we're getting near the end of this discussion.

And what are you going to do tomorrow, Mary?

MS. DROUIN: We are going to come in and--

MEMBER CORRADINI: Repeat this?

MS. DROUIN: And we were not going to come in tomorrow and have any technical discussion. It was going to be basically, you know, at a high level what were the stakeholder comments and what's our path forward.

CHAIRMAN KRESS: Why don't you do that? That sounds like a good --

MEMBER APOSTOLAKIS: When would I have an opportunity to recommend my views on margins? A letter?

CHAIRMAN KRESS: Yes. You can --

MEMBER APOSTOLAKIS: In May?

CHAIRMAN KRESS: We may have a letter this meeting.

MEMBER APOSTOLAKIS: Interim letter?

CHAIRMAN KRESS: Yes. You're welcome to draft something up and let's look at it.

MEMBER APOSTOLAKIS: Well, I have to see

what the sense of the Committee is.

MEMBER WALLIS: It depends on what the sense letter is. I mean if the letter is a preliminary sort of letter with another coming in May, which is more final, I think I might not have comments.

CHAIRMAN KRESS: I guess we need to discuss this offline.

MEMBER APOSTOLAKIS: Yes, we need to.

CHAIRMAN KRESS: Yes. We need to discuss whether we ought to have a letter this time or wait until May and what the nature of it ought to be. But we can do that offline.

MS. DROUIN: I mean, it would be nice, and I can't tell you what to do, but --

MEMBER POWERS: Oh, yes, you can. Come on. It won't be the first time. Come on, Mary. We've known you for a long time.

MS. DROUIN: You know, to me there's two different letters. You know, whatever you want to say about safety margins is certainly welcome. But if we ended up not going anywhere and doing anymore on this, it becomes kind of mute. But if you're going to give us a letter on a technical issue, I'd love to hear not just safety margins but a lot of the kind of things

we've touched on today.

CHAIRMAN KRESS: I think that's the kind of letter we may put together. Plus, I agree --

MS. DROUIN: Of the things you'd like for us to pursue and polish. Maybe that's a kind of good letter, I don't know.

CHAIRMAN KRESS: Of course we need to get it down in writing.

MEMBER APOSTOLAKIS: I think what David said earlier suggests that maybe the letter that will address the SRM will be in May. An Interim letter on the technical contents of the framework --

CHAIRMAN KRESS: I think --

MEMBER APOSTOLAKIS: -- which is not what the SRM asks, you can very well write this at this meeting so they will have the benefit of a document.

CHAIRMAN KRESS: That's what I think we'll do.

MEMBER APOSTOLAKIS: Yes. And I think it's fair to the staff and it's the proper way to proceed.

MEMBER ABDEL-KHALIK: As to what we would like to see before they publish this new reg?

MEMBER APOSTOLAKIS: Yes, or in future work what they should work on. I mean, it's not --

MEMBER WALLIS: Well, the answer to SRM

may be very simple. It may be that to avoid ad hoc approaches to all these future reactors, there must be a framework.

MEMBER APOSTOLAKIS: I think you're right.

MEMBER WALLIS: Yes.

CHAIRMAN KRESS: We've had an offer to hear a few words from Areva on the PBMR. I think it would be very interesting.

MR. BURNS: If you're willing to do that.

MEMBER APOSTOLAKIS: Okay.

MR. BURNS: Ed Burns, Licensing Manager for Pebble Bed. It's not quite Areva, but it's international.

What we're looking at is the timing in everything else. If we come in with a design cert, we have to deal with the process we have in front of us, and that's Part 50 and Part 52. And we have to deal with it in an efficient manner and with a number of technical issues that are new to the reactor design. But what we look at in terms of pre-application , and we had a number of meetings with the staff and very useful in that, to plan out a series of white papers over a period of the last year, this year that looked at items in the early part, about four white papers were right on top of this topic. But not focusing on

the framework, per se.

The first paper was on the probabilistic risk assessment. And that is how do you look at a -- and I won't use the word living -- but how do you look at a probabilistic risk assessment for a new design from a clean sheet of paper? How do you put together all of the new standards that we have out there since the last five or six years that were not available 20 years when the regulations were written? How do we look at, once we get that PRA, how do we use it properly? So then we gave a second paper on licensing basis event selection. And from that if you can follow those events down into a series of families and then pick what is conservative or the design basis accident conservative representative events, sequences from that, and that would be a useful use of the PRA.

The safety classification I think has already been talked about. South Texas, the 50.69 and the four boxes. Well if you had a clean sheet of paper, you probably wouldn't want to go that route. So we gave in a third paper that specifically looked at safety classification in terms of a clean sheet of paper. In terms of what Mary's presented here earlier, if there are two classifications plus some additional special treatment for those items that you might want

to raise the reliability on.

Then we also in December submitted a fourth paper, and that is on defense-in-depth. We're saying okay. We've got a very decent PRA. We think we know how to use it. We think we know how to design this reactor. But in reality we have to step back and ask ourselves from a designer standpoint there are certain things we can put in the design, but from an applicant who is going to use the design there are a number of programs you can bring in. Whether they're maintenance, operations, RT&SS, various other types of programs can bring in, the radiation protection, all the various tech specs and everything. And you can bring a number of programs in that will also work with the design to provide a requisite level of defense-in-depth.

And then we added a third thing to that. We said if we've got that good PRA, if we truly believe in it, can we use that to help us take a good clean look at do we have the right design and do we have the right match up of programs to provide an adequate defense-in-depth? We weren't focusing on just the uncertain, the low probability. We're focusing also what the designer is faced with, and that is on the high probability. The normal

operations. The AOOs. And as you start moving into the design basis accident region and then as you work through that. So we weren't going from an outside ten to the minus eight look forward, we were going from a normal AOO design basis region outward. And we should be able to get to the same answer if we're both on the same approach.

So what we're looking at is the value of the elements of what's inside the framework. Not the overall framework itself, because that's not going to be here in a time that's going to be useful to pebble bed. But the elements of it I think are very useful to us. And we've provided four papers to the Commission for their review.

CHAIRMAN KRESS: It sounds like those papers would be very interesting for us to read.

Thank you very much. It was useful.

Well, I think we may be near the end of today's session. Does anybody have any burning issues they want to bring up before I adjourn this meeting? Anybody want to say anything else?

MEMBER ABDEL-KHALIK: Can I just summarize what I think --

CHAIRMAN KRESS: Yes, please do.

MEMBER ABDEL-KHALIK: I sort of stand.

CHAIRMAN KRESS: He's going to summarize for us.

MEMBER ABDEL-KHALIK: I think a great deal of thought and effort has gone into this work. And I would like to compliment the staff on a job well done. This is a very written document.

MS. DROUIN: Thank you. Plus our contracting team.

MEMBER ABDEL-KHALIK: Like most other members here I would be very troubled by the possibility that all work on the framework would be stopped. I would like to be able to capture the knowledge and wisdom that has been gained by going through this process. But before publishing this document, I'd like to see the issues and concerns raised in the discussion here today at rest to make this a truly worthwhile document.

And, you know, different members have different specific issues that they would like to see corrected before this is viewed as a complete document.

The third thing is as part of this process I do support the idea of putting this knowledge and wisdom to good use by going through this experiment of piloting this process or comparing whatever you're

going to get with the process that's being contemplated for the gas cooled reactor.

CHAIRMAN KRESS: Excellent summary. I think it wraps up my thoughts --

MEMBER APOSTOLAKIS: I think he should write a letter.

CHAIRMAN KRESS: I think it wraps things up very well. Thank you very much.

Anybody else want to add to this?

MEMBER WALLIS: I have a comment.

CHAIRMAN KRESS: Oh, okay. Let's hear his comment first and you can respond to both of them.

MEMBER WALLIS: Well, I like what you've done. I think there are ways to change it that could improve it. But I think you've come a long way.

Really this is the time, I think it's a new era in reactor technology and commercial applications for a breakpoint. We've had these light water reactors and nothing happened for a long time. Now there's a prospect of a whole new set of technology and so on, it's a new era. And I don't think that ACRS having sort of one letter and one meeting is probable the final answer. This is going to be a really important step for the agency. The ACRS needs to mull this over probably for a year or

something.

So I hope if we write a letter and that we don't say this is the end --

CHAIRMAN KRESS: I hope not, too.

MEMBER WALLIS: -- that there's a lot to be done. And it may well be that what's actually implemented doesn't look quite like what's in this document that you've presented here, but it's a great first step anyway.

MEMBER APOSTOLAKIS: Yes. So that there will be no misunderstandings, I do appreciate the document, the quality of the document and the effort that went into it. I mean the comments that at least I have been making are intended to, my opinion, improve it. I mean it's not that I don't like what I see. I think it's great.

I'm really concerned about this statement that the work will stop. And maybe we can recommend, if we agree, that what Stu suggested actually become a formal recommendation: That they use the PBMR for which there seems to be some time without the pressure of an actual application to try some of these things. And maybe even quote McGaffigan. He wanted to see an actual application. I mean, here is an opportunity to do that.

So the staff won't just -- as part of its review of the white papers, maybe there ought to be a task of seeing how the framework would apply to these things. Maybe that would be a very -- I would hate to see this work stop. Because I know what's going to happen. The moment there is an application they will see, gee, you know look at the existing regulations. How can we proceed? Because they want a license. They are not interested in developing frameworks, right? So it's up to us collectively to make sure that we're prepared at some point to say "No, we have this approach and we think this is the right way to do it."

So the PBMR white papers it seems to me are an excellent opportunity. Maybe it's not the ideal opportunity, but it's a very good opportunity to actually do this.

CHAIRMAN KRESS: It would seem to me so, too.

MEMBER APOSTOLAKIS: Yes.

CHAIRMAN KRESS: Any other comments of Members before Mary?

Mary, why don't you make some closing comment?

Once again, I second this thing. I think you guys have done a marvelous job. This is an

excellent document. And it really represents a real step forward in making a coherent regulations.

MS. DROUIN: Well, I think today's been a very productive discussion. I know that the team has heard it, and I know I've said it in public many times, the issues here are very complex.

And we go back and forth among ourselves many, many times. As you look over time and you think, well we had this huge document a year ago, we had it two years ago, we had it three years ago. It's not like three years ago we had ten pages and we've done 50 pages. And it's because the technical issues, as every Member here has recognized, are very complex, has a lot of little subtle and nuances. And we are going down a new path.

I certainly liked Dr. Wallis' words of a new era. Because I think this is a new era. And do we start down that or do we continue? I like to look five, 10, 20, 30 years down into the future. Do we keep going the way we've been? You know, we have new knowledge, we have no information and when do we start applying those to improve the way we do business or do we still keep driving that old Model-T.

So I appreciate all the discussion. And I think we're going to have a lot more discussion.

And I don't know in the end what this thing's going to ultimately going to look like when it's thoroughly vetted out. It may have one resemblance to today, but we do need to start forward. And I think to move forward to the next step we have to start trying to test it.

I think that we're at a point where we can publish this in the sense of now trying to test it and improving and seeing what works, what doesn't work, where do we need to add things and delete, whatever.

So I welcome and really appreciate the ACRS' support in that area.

Also, I really want to recognize that we've had a tremendous team on this program. You see some of the members up here, but there's been a lot more besides just John from Brookhaven and Tom and Marty. I certainly want to recognize some of the ones that are here. Bruce from ISL, Vinod from Brookhaven. Dennis Bley is not here. Ben's recently joined us. I think we were scaring him off.

MEMBER APOSTOLAKIS: The staff? He joined the staff?

MS. DROUIN: He's been with the staff, but he's joined. This past six months he's been trying to come up to speed on the framework document.

Stu Ruben has been an integral part of helping this. And other various people. So I apologize if I've forgotten somebody's name. So we really appreciate the support.

But I'm going to let John say the closing remarks.

MR. MONNINGER: Actually, I believe Mary summed it up very well along with the Committee members.

I mean in terms of timing we are interested in as much and as early feedback from the ACRS as possible. I mean, it only benefits us in our decision making. You know, recommendations to the Commissions in May. And I think if the ACRS letter on something like the framework was to come later than sooner, you know, it makes it extremely difficult to consider those comments.

I mean there's been issues in the past where the staff has flowed up positions in a Commission paper and within a very short time frame at the same time the ACRS has. And one has to go before the other so they can be appropriately balanced out. But we definitely appreciate your insightful views on the needed future of this project. And we'll definitely take that back and discuss it and look

forward to many future interactions.

So, thank you.

CHAIRMAN KRESS: Thank you very much.

Well, I'm going to check 30 years from now to see where you are.

Okay. I'm about to do this. Okay. We are adjourned.

(Whereupon, at 4:21 p.m. the Committee was adjourned.)