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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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BRIEFING ON SPENT FUEL POOL ACCIDENT RISK
AT DECOMMISSIONING PLANTS

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PUBLIC MEETING

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ROCKVILLE, MARYLAND

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TUESDAY
FEBRUARY 20, 2001

The Commission met in open session, pursuant to notice, at the Nuclear Regulatory Commission, One White Flint North, Rockville, Maryland, at 10:30 a.m., the Honorable Richard A. Meserve, Chairman of the Commission, presiding.

COMMISSIONERS PRESENT:

RICHARD A. MESERVE, Chairman of the Commission

NILS J. DIAZ, Member of the Commission

GRETA J. DICUS, Member of the Commission

JEFFREY S. MERRIFIELD, Member of the Commission

EDWARD McGAFFIGAN, JR., Member of the Commission

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

ANNETTE L. VIETTI-COOK, Secretary

KAREN D. CYR, General Counsel

PANEL 1

RALPH BEEDLE, Senior Vice President & Chief Nuclear Officer, NEI

David Lochbaum, Nuclear Safety Engineer, Union of Concerned Scientists

DR. DANA POWERS, Member, ACRS

RAYMOND SHADIS, New England Coalition on Nuclear Pollution

PANEL 2

FRANK MIRAGLIA, Executive Director for Operations

DR. ASHOK THADANI, Director, RES

BRIAN SHERON, Associate Director, Project Licensing & Technical Analysis, NRR

JON JOHNSON, Associate Director, Inspection and Programs, NRR

WAYNE HODGES, Director, Technical Review Directorate, SFPO, NMSS

GARY HOLAHAN, Director, DSSA, NRR

A-G-E-N-D-A

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

(10:30 a.m.)

CHAIRMAN MESERVE: Good morning. On behalf of the Commission, I'd like to welcome you all to today's briefing concerning NRC's evaluation of the risk of accidents involving spent fuel pools at nuclear power plants that are either permanently shut down or in the process of decommissioning.

As I think all of you in the room know, there is some history surrounding this. It has been an area of Commission interest and action for a number of years.

Staff has prepared a study to evaluate the potential for accident risk that was publicly released in draft form early in the year, and then released again in December. Although the study just evaluates the risk issues, the outcome of this study obviously could affect a number of policy issues including emergency preparedness, security requirements, insurance, and a variety of related matters.

The staff plans to submit a policy analysis based on this study to the Commission in May, and so we do anticipate that we will have an opportunity for further evaluation of the policy implications of this study when we receive a staff paper later in the spring. Nonetheless, my colleagues on the Commission and I thought it would be helpful at this early stage to have those that have been involved in the evaluation of this study appear before us, along with the staff, to discuss the efforts.

We will be hearing from two panels today. The first panel includes a number of NRC stakeholders, including Mr. Raymond Shadis, Mr. David Lochbaum, Mr. Ralph Beedle, and Mr. Dana Powers. Then we will have a second panel that will consist of presentations from the NRC staff.

Before we begin the presentations today, I must remind all participants that they are not to discuss any substantive matters related to spent fuel pool accident risks that may be pending before an Atomic Safety and Licensing Board or the Commission in an ongoing Agency adjudication.

I would note that there is an issue in the Shearon Harris spent fuel pool license amendment proceeding involving a postulated degraded reactor core accident eventually leading to an exothermic oxidation reaction -- that is, a fuel cladding fire in spent fuel pools at that facility. There is a particular scenario that is under evaluation at that facility. There should be no discussion of this specific issue or whether the postulated degraded core accident in postulated spent fuel cladding fire events in the Shearon Harris pools are remote and speculative.

With that cautionary note, we may proceed. Mr. Shadis?

MR. SHADIS: You've caught me by surprise, Mr. Chairman, as I was looking at our agenda and presumed that I was to follow the other speakers.

CHAIRMAN MESERVE: I'm sorry, I don't have the agenda before me, and I just looked to my left and saw you were the first person.

MR. SHADIS: This is fine. We have a motto in Maine, which is "Jerigo" (phonetic), which is "I lead", or "Here I go again".

CHAIRMAN MESERVE: Would you prefer to wait? I'm happy to do this in the order in which it was listed.

MR. SHADIS: I would really appreciate that. Take Mr. Beedle first then.

CHAIRMAN MESERVE: Mr. Beedle, you are up first then, and I apologize.

COMMISSIONER DICUS: Oh, good, that helps me because I was shuffling through my stuff.

MR. BEEDLE: Thank you very much, Mr. Chairman. Good morning.

Mr. Chairman, we appreciate the opportunity to talk with you and your fellow Commissioners this morning on this topic. As you know, it's one that the industry has been very interested in for a number of years, and we've been working it seems like forever on this particular study, so maybe this does represent a point in time where we draw some finality to the study, but maybe at the conclusion of my remarks we may not want to draw finality in it. Could I have the first slide, please.

(Slide)

I think the effort to try and get a clear and coherent decommissioning policy -- and that goes beyond just the fuel pool -- is something that we've struggled with for a number of years, and one that I think is really needed. I do believe that this study is an effort to try and move that process a little further down the road. But both the regulator and the stakeholders, including the industry, the States and the public in general, I think are all very interested in the implications of the storage of spent fuel onsite, and the fuel pool is one of those mechanisms by which that's done, obviously.

From the standpoint of the licensees who are going through a decommissioning process, we had a number of cases where exemptions have been granted for security, emergency planning, and the insurance issues because they do represent a significant cost. And in the case of the plant with the fuel in the pool, long-term decay heat is relatively low, it's our conclusion -- and I think the conclusion of the staff in granting those exemptions -- that the risk to the public is minimal in those cases, and certainly justifies the reduction in the requirements that were levied on the operating plants for EP, security and insurance.

The other point that I would hasten to point out is that as we went about the process of conducting our review of the decommissioning process and establishing the amount of monies that were required for funding of the decommissioning process, there was little anticipation that we would incur the long-term cost of some of these programs that are envisioned as a result of this study that we are dealing with today.

I think the problems that we're looking at are -- if you look at just the surface of the study and look at the Executive Summary in this report, it says that "These fuel pools meet the QHOs", and so therefore we shouldn't have to worry about the substance that's embedded in the studies.

And I go back to the time when I had my final exam and I got an 80 on it and I wasn't happy with that because I thought there were errors in grading, and I said to the instructor, "Hey, I'd like you to review this exam".

And he said, "Well, what are you worried about, you passed the course".

And I said, "Well, yeah, but that exam is going to have some implications in the long haul when I go try and do some advanced education or get entered in another program. How well I did on that exam is very important".

And I would suggest that this study that we have, while we demonstrate with these extraordinary events, extraordinary consequences, unusual conditions -- yes, we meet the QHOs -- that the study is not right. It does not represent a realistic risk assessment of the fuel pool risk that we have at these plants.

And so if we're going to use that as a springboard for policy development, I think we need to go back and make sure that that study is done and done correctly. May I have the next slide, please.

(Slide)

Just some specifics, and I'm not going to go into a lot of detail, but we see that the risk study that we've done is incomplete in a number of cases -- just, for example, the cask drop issue. We just make an assumption that cask drop breaks the fuel pool and it leaks and you've got a problem on your hands. There's really little assessment of whether or not that cask drop is reasonable, if it's an assumption that's warranted, or that there's any analysis that goes beyond just the fact that the cask is dropped.

Overstatement of risk: I think there are a number of cases the staff was challenged by the ACRS to go back and look at

the release of ruthenium, and so we go from zero ruthenium to 100 percent ruthenium, and we don't do anything in between. There's no real -- it's sort of an abounding analysis in that case, and I think it leads you to some conclusions that are unwarranted. So, from an overstatement of risk, I think that's a very important element.

Piecemeal: It seems like every time we push down one issue, something else pops up. We dealt with the human factors earlier. We dealt with the slow leak that was undetected. We got that kind of contained, and then all of a sudden we've got ruthenium to deal with.

Now, I'm not suggesting that ruthenium isn't an issue, but I mean I've spent 40 years in this business, almost, and ruthenium didn't come into my vocabulary until Dana Powers raised it an ACRS meeting sometime ago. So now I -- he's going to probably tell you that my education is lacking in some respects, and that may be true --

COMMISSIONER DICUS: Dana, you're on report now.

MR. BEEDLE: And the final point on the study, I would say, is that it was put together by I think some very well meaning technical people within the Agency, but I don't think it's gotten the review that is really warranted for something that has the impact that this does for the licensees as well as the NRC in its regulation of these facilities. Next slide, please.

(Slide)

It appears to me that this study is dominated by the seismic events that we've talked about, and the issue that I continue to ask my people as well as others that are familiar with this study is why we deal with the safe shutdown earthquake in the design, and yet we take a look at this extraordinary series of events and the probabilities of an earthquake -- we've gone from an earthquake that we think might occur in 10,000 years and we're now pushing it out to a million years. And I look at that and I say, what is the purpose of this?

Now, if it's to demonstrate that even under these extraordinary circumstances we manage to achieve a risk that's below the QHOs, it still doesn't serve us well in trying to figure out how to then go about addressing policy as a result of this study. That is probably my biggest concern with regard to this study.

I have -- and I apologize for not having these slides ready at the time we put our slides in, but we do have that on the Vu-graph, and if you would bring up that next slide, please.

(Slide)

What I've tried to show is that the safe shutdown earthquake, over here on the left-hand side, compared to the study evaluation, is a very, very small risk. And we find that the contribution to risk for this pool is -- some 95 percent -- is all the way to the right. So, we're looking at an extraordinarily unusual event, but one that if we carry it out for a millennium, we can garner enough risk that you have to consider it in the study. So, that's why I think that we have just gone well beyond reason when we start looking at these earthquakes that have such unusual probabilities.

Does an earthquake of 2g or 3g have significant implication? Absolutely. I think a loss of gravity accident has implications for these plants, but that's what we are looking at as an extraordinary event with extremely low probabilities, but one that you can garner significant increase and probability by extending it out for this long period of time.

Now, the rubber meets the road at our licensees, and I think Mike Meisner, who has testified before this Commission on a number of events -- I would like for Mike to just make a few remarks about the impact of this study on his plant. Mike?

MR. MEISNER: Thanks, Ralph. One of the problems that we find from this report is that even though we meet all the QHOs and all the risk measures that you could postulate, the staff has introduced another new thing into the study, and that ius the notion that these zirc fires can always happen, and that's primarily because you can have a partial draindown that inhibits the natural air circulation flow. And because they can always happen, then go beyond risk informing -- they're thinking -- and get back into deterministic space and suggest things like we need to review all the exemptions that they have granted up to this point.

These partial draindowns, the fracturing of the spent fuel pool notions, are good as simplifying assumptions in risk analysis, but when you move beyond risk and deal with the simplifying assumptions themselves as policy, we get into a lot of problems.

Clearly, the kinds of public attentions and concerns that were raised when this report was issued was something that we had to spend a lot of time dealing with at Maine Yankee and other plants as well. But the main point I wanted to make is, it's fine to assume a pool is going to bust and instantaneously drain for purposes of a risk study, but when you look at what can really happen out there, it's entirely different.

Maine Yankee, partial draindown, we analyzed that nearly four years ago. It's recoverable. We can drop a cask into the pool, worst case cask drop, and have a leakage of less than 5gpm. Both these things the NRC assumes in their study are cask dropping failures. Similarly, the pool is founded on bedrock, that's why there is very little leakage. So, similarly, in a seismic event, you would have something that wouldn't be a catastrophic failure but some amount of leakage that can be made up.

Like Ralph said, I've talked to you a couple of times before, and the kinds of concern I raised go to a zero-risk mindset on

the part of the staff. I'm afraid we're still there. And I would ask, as you listen to the staff study, to distinguish between where something is risk-informed and where it starts becoming zero-risk informed in their decisionmaking. Thank you.

MR. BEEDLE: Thanks, Mike. Another aspect of this study that -- and we've seen this occur in other situations where the staff has produced a study or report, and other members of the staff pick up that study, even though it's draft, and try and implement the study or draw some conclusions from the study that affect the operating facilities.

And in this case, we've had similar results with this study. And I'd like to call on Russ Miller, who is the President and CEO of --

COMMISSIONER MERRIFIELD: Excuse me, Mr. Chairman, I have to inject -- I understand what Mr. Beedle is doing here. We put together -- and I don't want to focus on any one person. We did put together an agenda. We asked that certain individuals come before us. And I was not aware that we were going to have a litany of people come forward.

Now, I demur to your chairmanship if you want to allow this to happen, but this is not the way that this meeting was planned, and I certainly wasn't prepared for it with the materials that were inserted on the part of NEI.

MR. BEEDLE: Well, okay, then let me tell you what happened. We had members of your staff up at the Millstone facility in the Northeast, telling members of the public that there would be no more exemptions granted on the basis of this study.

So, we've got a draft study that's now being used to establish policy, without the benefit of review by the Commissioners. And that's what Mr. Miller would tell you.

CHAIRMAN MESERVE: Is this the last of the additional people you wanted to have speak?

MR. BEEDLE: He is the only one I was going to call on beyond that.

CHAIRMAN MESERVE: How long is his statement going to be?

MR. BEEDLE: There's no need for that, I've just told you what he was going to say. May I have the next slide, please?

(Slide)

If, indeed, the Commission is going to expect the staff to develop policy based on this study, I think they need to relook at the study and get it down to the point where there is some more realistic treatment of the events that are analyzed in it.

We are recommending, or NEI is recommending, that we take a look at best estimates, that we provide some reasonableness in these evaluations, that we truly look at risk in forming that study. And as you have done in the case of probabilistic risk assessments where there is a call for review of those risk assessments, I think there needs to be a risk assessment for this -- a review of this risk assessment for the fuel pool. It's got far too wide implication to just be the product of one small group within the Agency.

And I would say that within the Agency there is a differing opinion on how the treatment of these analyses has been done. So I think that needs to be looked at very carefully.

And I think that the Commission needs to provide some guidance to the staff on how to deal with these studies. Before the Commission makes a decision on the policy implication of these studies, I think the staff needs to refrain from drawing some policy conclusions on the basis of the draft studies.

So, with that, Mr. Chairman, that concludes my remarks and, if I've disturbed the agenda, I apologize for that, but I think I'm within my 15 minutes. Thank you, sir.

CHAIRMAN MESERVE: Thank you very much, Mr. Beedle.

Mr. Lochbaum?

MR. LOCHBAUM: Good morning.

(Slide)

The older George Bush was president when Don Provatt and I submitted a Part 21 report on incompletely analyzed spent fuel pool risk. I take some comfort in his son, rather than his grandson, being president during today's briefing on incompletely analyzing spent fuel pool risk. Slide 2, please.

(Slide)

The staff's risk report is incomplete because it does not account in any way for the risk of sabotage. It is also incomplete because it relies on conditions which may not be realistic.

Rather than revising this report, UCS recommends that the NRC require plants to be decommissioned under a Part 72 instead of a Part 50 license. Slide 3, please.

(Slide)

The staff found that the spent fuel pool risk at decommissioning plants is limited to large earthquakes and cask drop events. Slide 4, please.

(Slide)

But the staff did not attempt to quantify the risk of sabotage, nor did the staff conduct a qualitative analysis to show that the sabotage risk was less than the nine scenarios that they did consider.

When you don't look at something, it can never, ever show up as a risk factor. That doesn't mean it isn't a risk to be reckoned with. Slide 5, please.

(Slide)

The staff's report states, or implies, that the security for spent fuel at a decommissioning plant is the same as the security for a reactor and operating plant. That is simply not true. Slide 6, please.

(Slide)

It is not true because the OSREs don't performed over the last nine years at operating plants tested reactor security, but never, ever tested spent fuel security. OSREs are not performed at all at decommissioned plants. Spent fuel storage security is already less at decommissioned plants and operating plant reactor safety. And security has been relaxed at some plants based on obsolete knowledge. Slide 7, please.

(Slide)

The staff's report acknowledges that there are fire hoses already staged on the refueling floors at decommissioned plants. When I toured the Millstone 3 plant last July, which is not decommissioned, I did see the fire hoses staged there to add water to the pool.

Instead of bringing in explosives to blow a hole in the spent fuel pool side or floor, wouldn't it be easier for terrorists to drain the water out of the pool, using the hose that the plant owners conveniently provide? You could just siphon it out. Slide 8, please.

(Slide)

The staff concluded that the spent fuel pool risk was so low as to preclude immediate regulatory actions. Slide 9, please.

(Slide)

But that conclusion is based on the assumption that every decommissioned plant complies with ten commitments that are listed within the report. The staff concedes that the risk is ten times higher if those ten commitments are not met. Slide 10, please.

(Slide)

Since the commitments appear important in properly managing the risk, shouldn't plant owners rather than NEI be making these commitments? If not, haven't we set the stage for workers at plant XYZ unknowingly undoing one or more of these ten commitments? Slide 11, please.

(Slide)

If that's the case, then what happens if plant XYZ fails to meet NEI's commitments? Can and will NRC take enforcement action against its owner for something NEI pledged but couldn't follow up on?

The NRC can issue a startup order to a permanently shutdown plant, so what would be the ultimate sanction for a decommissioning plant for failing to comply with one of these commitments? Slide 12.

(Slide)

In conclusion, we hope that the consensus conclusion from all stakeholders would be that spent fuel represents a risk that must be properly managed. The disagreement, therefore, seems centered on how to best manage that risk. We believe it would be futile for the staff to revise this report. It appears unlikely that the revised report would apply to any plant, and virtually certain that it would never apply to all plants. Slide 13.

(Slide)

Fortunately, there is a solution and, since I work for a nonprofit organization, I can offer it to you for free. 10 CFR Part 72 was promulgated nearly 20 years ago when a way for reactor spent fuel storage was being considered. Yankee Rowe's reactor vessel has now been shipped to South Carolina, leaving its spent fuel away from a reactor, albeit in an unforeseen method. Slide 14, please.

(Slide)

Transitioning to a Part 72 license would require plant-specific safety analyses of spent fuel storage, including security threats from sabotage. Industry and staff resources would be better used for these plant-specific safety analyses than for continuing the circular debate over the generic spent fuel pool report. If spent fuel is the dominant threat at decommissioning plants, then Part 72 is the proper way to manage this threat. Thank you.

CHAIRMAN MESERVE: Thank you, Mr. Lochbaum. Let me note that I think that I, and I think probably all of my colleagues, did not get your last slide. We have a slide 13, but not a slide 14. You might want to provide copies.

MR. LOCHBAUM: I'll check on that. I thought I had submitted it.

CHAIRMAN MESERVE: Mr. Powers -- Dr. Powers -- excuse me.

DR. POWERS: We've written to the Commission a couple of times on the spent fuel pool. First, it was at your behest to conduct a technical analysis of the issue. We originally responded that we thought that the staff's analysis was not technically defensible especially with regard to accident progression and accident consequences. And we spoke to issues concerning the thermal-hydraulics reaction kinetics, sufficient product release, Ralph's famous ruthenium release, and decrepitation of the fuel -- had you heard of decrepitation, Ralph?

MR. BEEDLE: No.

DR. POWERS: -- in the calculation and consequences. In making the comments, the ACRS was operating under the belief that the Agency was looking to undertake a thorough reexamination of the rules that it imposed on plants to conduct decommissioning, with an eye toward moving those regulations and requirements more toward a risk-informed or possible performance-based approach. It was the ACRS belief that one could do this only if one had a good, solid understanding, a deterministic understanding, of accident progression and accident consequences. And I would say that the ACRS still believes that it would be timely for the Agency to undertake a thorough examination of its regulations and requirements for decommissioning plants.

Staff revised their original analysis to take into account comments the ACRS had made at least in a bounding sense. They focused this revised analysis really on a specific question concerning the risk effectiveness of emergency preparedness measures, and that is they did not portray to us that the analysis was a comprehensive understanding of accident progression and accident consequences that might be needed for a risk-based reevaluation of decommissioning regulations and, for the limited purposes of making decisions concerning the need for emergency preparedness, the staff prepared what the ACRS thought was a very adequate, risk-informed, somewhat bounding analysis. And I think we wrote to you in support of that analysis.

The ACRS has been surprised, however, that in transmitting the analysis to you, the emphasis that was given to precluding ignition of the clad in any sort of definitive sense.

First, we had thought there is sufficient industrial experience with zirconium fires in the absence of any decay heating whatsoever to show that there is always going to be some probability that zirconium clad can ignite. I have to admit to the experience of a zirconium fire in a laboratory since, and they happen for reasons that are difficult to understand.

The second is it really isn't a question the staff should be addressing. It's not a question of is there no probability of fire, it is rather when is the risk sufficiently low that we no longer need to regulate against it. And looking for physical impossibilities in this area is really quite futile. You're dealing with a system that has an enormous thermodynamic potential for reaction and is non-passivating in its nature.

During the ACRS review of the staff's revised analysis, we had the benefit of presentations by representatives of the industry and representatives of independent organizations. They had different points to make, but a consensus did emerge from all of those presentations, and that was that there was still substantial need for better phenomenological understanding of what is going on in the event of a spent fuel pool fire.

It is the ACRS' belief that you probably cannot understand these on strictly and analytic bases. We simply have no experience with these fires, and it would be the ultimate act for us to think that any analyst is going to be able to anticipate all the things that will happen in these relatively complicated high-energy systems.

One needs also to recognize that it is a risk question we're dealing with. ACRS has been appointed recently with some additional information that suggests it may not be so thoroughly dominated by the seismic events as one might suppose. We are equally well aware that the risk may well depend a lot on the ability to recover from actions and human responses to these, which is an area of weakness in our ability to analyze risk.

I will comment that there is not a great deal of data. We do have a sort of data point. A poorly instrumented test conducted in the former Soviet Union involved the exposure of some fragmented clad fuel in the presence of about 100 tons of gettering material, and we were able to get a substantial fractional release of ruthenium even in those cases.

Gettering, in this case, is an interesting process. It has to be locally efficient as well as globally efficient, and it is apparent that there are complications in the gettering reactions -- I think it can literally burn out -- and you get local releases of ruthenium that are not counteracted by subsequent reactions in the gettering regions.

Let me conclude by saying ACRS believes -- still believes -- it is timely to consider risk-informing the regulations for

decommissioning power plants, that the first in developing an adequate risk profile of these plants will be to have an understanding of the risk-dominant accidents -- and the spent fuel pool fire seems to be the risk-dominant accident -- and that it is probably not adequate to try to do this strictly by analysis.

At the same time, I don't think we can expect the staff to be able to do an analysis -- a single analysis -- that is adequate for every plant, every fuel type, every cladding type, especially as the fuel types themselves are evolving with time.

What the staff can be asked to do is to establish a framework for doing these deterministic analyses on a integral plant basis.

CHAIRMAN MESERVE: Thank you very much. Mr. Shadis.

MR. SHADIS: Thank you. I suppose we're looking to the Commission to decide when things stop being risk-informed and start being risk-determined or risk-driven, but our understanding of it was that we were really to take a look at the chances that things would happen. We would take a look at the potential risk in evaluating how much energy we would put into different topics, but it wouldn't be the end-all.

And so we are a little disturbed to find our friends in the industry consistently invoking risk information. I think we are working at risk information, and it's -- within the limits of that discipline, it's commendable.

The report itself, I'd like to just make three quick points on it. One, we were surprised to see how much in the report was an admission of the limits of data and admission of the limits of knowledge. In 1980, I served for a citizen group that was intervening at Maine Yankee when Maine Yankee was proposing to take their spent fuel assemblies apart and reconfigure them in a more dense packing of the pins themselves, and at that time we were looking at issues of criticality, at issues of the propagation of the oxidation reaction from one assembly to another, and under circumstances that I see surfacing again in this report 20 years later. And 20 years later we find the technical staff essentially saying that there isn't sufficient data to make conclusions about these drivers in an accident.

When it comes to the end product, the end result of this study, in the end, the information has to be taken to the public, to the affected communities, to the States that host nuclear facilities and spent fuel pools, for them to determine how they are going to react to the study, and to find all these provisos in there that say we really can't tell you if you get combustible material down on top of one spent fuel rack, if that happens to be very energetic fuel and it begins an oxidation reaction, will it propagate to the rest of the spent fuel pool. That question seems to be an obvious one and it isn't answered in the report.

The second quick point that I want to make is that we were involved in these discussions pretty much from the get-go. I think a lot of the drive for this initiative began at Maine Yankee, and we feel here -- after bringing issues to the staff, we feel there is a huge disconnect between their willingness to hear them and their willingness to enter into a dialogue or a discussion to determine what it is we mean when we bring an issue in. And I think we feel at disadvantage when the industry can be here literally every day, with meetings every day, when they can simply pick up a phone and have access.

The NRC can do something to level that playing field to address community concerns and public interest stakeholder concerns by establishing a mechanism for integrating those concerns, and we see it as maybe an office of Ombudsman. We've raised that issue before. There ought to be someone within NRC advocating for those citizens who are concerned about safety issues.

Finally, just a cautionary note. I think Mr. Beedle brought it up with respect to Millstone. NRC staff members feel fairly free to make statements regarding policy and the NRC's point of view on many, many technical issues, safety issues that are out there in the public.

We have people who are dealing with material safeguards who are quite willing to make statements regarding legal issues. We have people who are lawyers quite willing to make statements regarding safety and technical issues. And it's a constant theme of reassurance to the public.

In my experience of interacting with this Agency over 20 years, I have yet to hear a member of this Agency contradict a member of the industry in public and say that a safety issue is more significant than what the industry member has said. It is always -- always -- either in concert with the industry or going in the other direction to even say that there is less of an issue than what might actually be there.

And I attached to my statement a little release that was put out by Maine's Office of Nuclear Safety Advisor. That was a statement regarding this report, and I think it's illustrative of just how ill-informed State officials might be if they rely on licensees for their information. And I would urge the NRC to become pro-active in getting real, solid information out there for the States and the communities to evaluate. Thank you.

CHAIRMAN MESERVE: Thank you. Mr. Beedle?

MR. BEEDLE: On the slide thing, I had two pages of notes for the last slide, so I only provided 13 slides. I came up with a slide 14 fictitiously today. I didn't short you any slides.

CHAIRMAN MESERVE: Thank you. You made reference to a slide 14, and I couldn't find it, that's all.

I'd like to thank all of you for your presentation, and we will follow our normal practice of having questions of this panel, and then we will summon the staff.

Mr. Beedle, I'd like to ask you about your slide on the seismic events, where you indicate that the staff's analysis is precedent-setting on that issue, and I'd like to have you help me conceptually in how you think we should approach these kinds of issues.

We have a situation where risk, of course, is the product of the probability of occurrence times the consequence. And here we have a situation where you have a very low probability of seismic event that has very high consequences, that happens to drive the entirety of the risk analysis, and it's beyond a design basis seismic event. But I thought that was the point of going to a risk-informed approach, was that we would not be constrained by sort of deterministic assumptions at the outset about what's the maximum seismic event. We would look at the range of things and evaluate them on the basis of risk.

And your suggestion is that we should, on some basis, I think, take a low probability event and find a way to make it go away when, in fact, in terms of risk, it drives the risk because of the consequences of that event.

I'd like to have you sort of help me on the policy matter, how we'd go about doing that.

MR. BEEDLE: Well, I think you need to look at the probability, and you've done that in many cases. You've looked at the probability of events and said beyond this we're not going to discuss them because they're, you know, probably so low that it doesn't make any sense.

Granted, you could take a look at this extremely low probability event, and if it does, indeed, have extraordinary consequences, you could multiply those two together and say that the risk then becomes something that we need to be concerned about.

In this case, we've taken this seismic event and we've gone out for roughly a million years. We've taken this very small probability, multiplied it by a long period of time, come up with a probability that it will occur and, if it does occur, if you get an extremely large earthquake, then, yes, it would have significant consequences.

Now, does it tell the Commission anything to have an earthquake that is so significant in its magnitude that it disrupts and destroys the infrastructure around the plant, that we then draw a conclusion that because it destroyed the ability to deal with EP that we just won't worry about this earthquake at all? I don't think that helps you in policy space at all. It wouldn't help me make a decision on that.

So, I think you need to get back into some realm of possibility and determine what the consequence of that event is, and deal with it in a fairly realistic manner.

We did this with the safe shutdown earthquake for which the plants are designed. We took a look at the spectrum of activities in the mantle, what's the probability of that earthquake, and we said that's the earthquake that we're going to design for. It's outside the bounds of what we expect, but it's something that -- you know, it's the 150-, 200-year earthquake, or the 200-year flood, and things of that sort that the plants are designed for. That makes sense to me. I think you can build some policy on that.

Building policy on the loss of gravity accident does not make a lot of sense to me.

CHAIRMAN MESERVE: Dr. Powers, would you like to comment on this?

DR. POWERS: I think our general strategy in doing risk assessments in the seismic area is pretty much as you portrayed, that you look at probabilities times consequences and, as you move out in the probability space, the product does fall off fairly dramatically.

Mr. Beedle is correct, there is some probability at which we don't do the product and, if you want to pick a number about it, it must be somewhere around 5×10^{-7} because that's the point where we try to keep the event or the vessel failure, which is not analyzed typically in a PRA -- we try to keep the probability of that failure down below that level.

In this particular instance, I think that it is my perception that the analyses does not suffer by carrying the probability out -- probabilities of the earthquake initiating frequency out fairly long distances, but you're not going to get a non-convergent sum for the risk there -- that the consequences fool the client sufficiently that you keep the probabilities coherent. So, I'm not concerned about using low-probability earthquakes out to certainly the 10^{-7} range. To go beyond 10^{-7}, I think, strains the ability to predict the earthquakes. I think you would not get an adequate risk assessment if you confined yourself to the 200-year realm of earthquakes.

Now, it is also my perception that the staff, in the seismic analyses, still did a fairly bounding analysis and did not attempt to do what I would call a "best estimate" analysis on the seismic event, and it is also a piece of information that's come to us fairly recently that says maybe there are other initiators other than the seismic event, other than the cask drop, that need attention in setting up the risk profile here. It is clearly what we are interested in.

Our objective in doing a risk analysis is not to find out what kinds of things can happen in a severe accident, I think we know that accidents release a lot of radioactivity are bad. And what we're trying to do is fine out what kinds of things

make sense to have in place to either prevent or mitigate these accidents.

And, so, I myself am very interested in initiators other than seismic events, rare seismic events, I'm more interested in those things where design or processes can be successfully used to limit the amount of risk.

CHAIRMAN MESERVE: While I have you, you might touch on a point Mr. Beedle made that he'd never heard of ruthenium before.

DR. POWERS: Mr. Beedle has definitely heard of ruthenium before.

CHAIRMAN MESERVE: Well, I didn't take him quite literally either, but you might say something about this is obviously an isotope that is driving a lot of hazard here. What has changed that has caused this to be more -- come out of the staff study as having been more significant than had been previously. Is it the Russian data that you talked about?

DR. POWERS: No, no. This is strictly a function of the fact that these fuel rods that are in the pool have decayed away to the point that the iodine that we usually ascribe great attention to in thinking about accidents and power is gone.

We still have some Cesium-137. The next isotope that has interesting consequences is ruthenium, and in an ordinary power accident, we don't worry too much about ruthenium because those accidents are being driven by the clad oxidation by steam, and that is not such a strongly oxidizing medium. And the ruthenium that is present in the fuel is a metal -- and I think I am reliably informed, the boiling point on that metal is 2700 degrees centigrade, so high that very little release is thought to occur.

On the other hand, in a core heatup within the pool, you'll be heating up the air, and that's a very strongly oxidizing medium. And if one can free the fuel of the cladding so that the air is not reacting with the metal, then it will oxidize the fuel and subsequently oxidize the ruthenium to a state where it is extremely volatile, volatile on the order of iodine volatility. And ruthenium is a very peculiar radionuclide in the sense that it has, on the short-term, consequences rather similar to those of iodine, and the long-term consequences rather similar to those of cesium. So it attracts a lot of interest if you get release fractions that are large. If we have release fractions typical of at-power accidents which is fractions of percent, it just isn't a concern, it is overwhelmed by other things.

In this particular instance, this accident, it is not overwhelmed by other things, and the release fractions become a great concern. If you can get a situation where the gettering material, the clad, is no longer consuming the oxygen, that is major debate. And I will point that the staff has a similar debate for air intrusion during reactor accidents at-power, and they are participating in some experiments to investigate that competition between air reacting with the clad versus air reacting with fuel. And it's a fairly complicated problem because the air reacts with the clad in such an exothermic fashion. It puts so much heat into it, you can cause the clad to melt and drain away from the fuel and then, of course, you have fuel exposed to air and you get the high ruthenium releases.

CHAIRMAN MESERVE: Thank you. Mr. Lochbaum, I may have read the report somewhat differently than you did. As I understood what the staff was trying to do, is that they made a series of assumptions as to commitments that licensees would make, and then on the basis of those assumptions did an evaluation of the risk.

It was not, as I understood it -- this was not the policy document, that's to come in May, and let me ask first whether you are comfortable with the staff's analysis, assuming for the moment that the commitments are valid and are enforced?

MR. LOCHBAUM: Yes, I am satisfied with how they treated those assumptions or those commitments, yes.

CHAIRMAN MESERVE: And would you be satisfied if there were license conditions or other kinds of obligations that were imposed on licensees that the analysis would then be a realistic analysis as to any given facility?

MR. LOCHBAUM: I'd be comfortable not as a license condition because we felt that if you transitioned to a Part 72 license, you would have to, in that process, specify how you were dealing with these commitments so that the Part 72 license, when it was issued, would address all these ten commitments plus all the myriad of other things that had to be complied with or controlled.

CHAIRMAN MESERVE: But couldn't the commitments be embodied in a Part 50 license?

MR. LOCHBAUM: They are now, so they could be, yes. We don't think it would be the right choice, but it could be.

CHAIRMAN MESERVE: But at least as to that issue, you could it through Part 50?

MR. LOCHBAUM: That is correct.

CHAIRMAN MESERVE: Mr. Shadis, we have been trying hard as a Commission, let me say, to try to interact more directly with the public, make sure that we hear concerns, and it's unfortunate in this instance that that may not have worked as successfully as we had intended.

Let me say merely that this is the opening phase of what I think is going to be a continuing evaluation by the Commission of decommissioning issues, and that, as I've mentioned, a lot of the policy issues remain ahead of us to evaluate, and that I would anticipate that there will be opportunities for further interactions with all stakeholders on those issues as we go forward.

I have a question for you about the first point that you made, in that you indicated that you were surprised that the report acknowledges that there are limits to knowledge and that there are some open issues.

Were there any issues that were left open by the staff in the report that you think there is data available that would be adequate to respond to those issues?

MR. SHADIS: In terms of accident drivers, no. I don't have any knowledge of what might be available to the staff. One of the characteristics of this that disturbed us is that there seemed to be missing a feedback loop from real plant experience to inform the risk assessment.

Last spring, in removing the steam generators, Maine Yankee dropped I think it was in the range of a 14-ton steel beam off the top of one of their cranes. So, if you ask what the probabilities in a given year, based on recent history, would be for Maine Yankee, the probabilities of a heavy load drop would be one, the absolute. They are going to do it every year, as far as we can tell. And, you know, this didn't enter into the calculations.

When that plant was built -- and I hate to keep referencing that plant, but that's the one we're very familiar with. When that plant was built, the aircraft accident analysis took into consideration that the Navy is flying submarine chaser planes -- they are 43,000 pounds dry weight. The recent history, though, has low-level exercises being done in Maine.

A few years back, we had the Strategic Air Command flying Korean War vintage bombers at altitudes of less than 1,000 feet up and down the river. Two weeks ago, while at the plant, I saw another military refueling plane flying at low altitude. And I don't see where in the report the reality at our particular plant is reflected in these very sophisticated risk numbers for aircraft accidents or for load drop accidents.

There are assurances that if we have a partial draindown, it is recoverable. We don't know that, based on the plant design, from what we can see, and we also don't know what happens to the makeup water. If you have a fracture in the spent fuel pool and you are constantly adding water, makeup water, and it's running out through whatever that opening in the pool may be, it's tantamount to hosing down the fuel assemblies, a modification on hydrolancing. So, whatever accumulated activation products there may be, or fuel finds that have leaked out from leaking assemblies over the years, are going to be flushed overboard. We don't know what the doses will be to workers or what may flow offsite from any given plant. These kinds of things are not in the report. We don't find them.

CHAIRMAN MESERVE: Thank you. Commissioner Dicus.

COMMISSIONER DICUS: Thank you. I think we all pretty well agree there could be any number of initiating events, and whatever their probability might be, which I think we all agree is rather low, but I want to pick up on something that Dr. Powers mentioned about -- and something I didn't hear any of you talking about in much context -- and that is the ability to respond to the incident. I mean, we agree that the probability is quite low, but the consequence could be high. Isn't the real protection of the public health and safety becoming the ability to respond to the incident? So, I would like a little bit of feedback from you on that issue, any one of you.

MR. BEEDLE: Well, you still have operators -- you know, the fuel pool, you still have operators there that will respond. I mean, if we had an earthquake and there was some crack in the fuel pool or some derangement of a piping system, the staff is there to refill and provide water, notwithstanding --

COMMISSIONER DICUS: What about offsite consequences, though, response to that, emergency planning?

DR. POWERS: The central point of the staff study was that preplanning such emergency response had a limited impact on risk, that there was adequate time for a post-event response after some decay period had occurred. That was the central point they were driving home.

And that was particularly crucial in the earthquake context because you might well disrupt the ability of the plant personnel to respond. Other initiators -- you're clearly going to have the plant personnel, and it is also true that these fuel assemblies have decayed substantially. It does not take much water to keep them cool. So your plant response becomes crucial in all sequences that don't result in a catastrophic failure -- that is, something that leaks as fast as any water source you can put in. So, yes, there's a big response factor here.

And that is a very difficult thing for our current generation of computer codes to handle for computer models of a risk because, if you don't have proceduralized actions, they don't know how to take them into account as easily as they do the proceduralized processes. And it's very likely that responses to these events would be in a nonproceduralized sort of thing. I mean, it would be difficult to make up procedures to handle something that's very unusual. That represents a step in technology that I think the staff is, in fact, looking at in other contexts in the development of PRA technology, but it's certainly not inhand right now.

MR. LOCHBAUM: I think the only thing I would add to what Dr. Powers and Mr. Beedle said is that if it is indeed true that the response to most of these real severe accidents at the plants will be nonproceduralized, that seems to argue for a fairly large -- not fairly large -- some formal emergency planning response so you can guarantee that these ad hoc committees will be there to provide those nonproceduralized responses.

If the responses were all proceduralized, then the six guys, or whatever, you have working at the plant could go to the procedure, pull it out and find out what needs to be done. Sounds like that's not the right response, so you do need some

kind of formal response capability for each decommissioning plant.

COMMISSIONER DICUS: One of the things that I struggle with a bit is in our emergency planning, which I believe in, of course, but when a train carrying -- train that has a car in it that has a chemical, and that train derails, we don't have any formal emergency plans, yet we are able to evacuate. I struggle with this a bit. And we do so without loss of life, generally.

And so -- I mean, I agree with the emergency planning, I'm not saying I would back off of that, but at the same time I think some realism needs to be put into the formula.

MR. BEEDLE: I think Dana raised the real issue of how does the staff deal with this from a calculational point of view, if you don't have a procedure to fall back on. I mean, that becomes the starting point for doing some of the analysis that we have to go through.

COMMISSIONER DICUS: Mr. Lochbaum, you suggested that there might be a problem with having a water hose near the spent fuel pool to refill it if there should be a problem. Are you suggesting then, therefore -- you mentioned that that could be used to siphon the water out of the pool. Are you suggesting that we not have it there?

MR. LOCHBAUM: No, I'm just suggesting that perhaps you could have it under lock and key so I couldn't use it that way -- or not me, but other folks might not use it that way.

COMMISSIONER DICUS: And if I could back up on something that the Chairman mentioned, and Mr. Shadis, the fact that we are actively pursuing public participation, actively looking at how we do interact with the public, and I think we're going to have a workshop or a briefing and have members of the public in to tell us where we are not doing the kind of job we should -- I think Mr. Lochbaum would back me up on this in one of his slides, I remember it quite well -- but we are very actively participating and trying to improve not only our interaction with the public, but when you, the public, as a representative of the public, interacts with us, you have a feeling of what you said -- we may not adopt what you said, but we listened and we responded to it. So, I do want to back up the Chairman on that.

MR. SHADIS: May I comment on that just briefly? The system, so far, has consisted of an invitation -- and the Agency has been gracious -- I mean, they really have been reaching out to invite people to come to these things and participate, but we get the invitation to provide input, we provide that input and then there is a -- generally, there is a response and it's a rather quick response. Quite often, it is so fast we consider it not to be a considered response. And in general conversation when we're trying to work out ideas, there's give-and-take, you know, and that element where the Agency would reach back to try to be certain that they understand what we're saying and we can communicate back and forth, I think that part is -- that's real important.

I'd also just like to comment briefly, if I may, in terms of emergency response planning. There are a great number of variables admitted in this report -- whether or not the boral and boraflex will slump, whether there is a eutectic response in terms of melting the boral and so on -- there are a lot of things that might contribute to a dose offsite quicker than one would anticipate. And even over time, we are not certain about transport mechanisms for the products of the burnt fuel. So, we may be looking at a larger area, a longer, huskier dose. We really haven't seen a good assessment of it yet.

COMMISSIONER DICUS: Thank you.

CHAIRMAN MESERVE: Commissioner Diaz.

COMMISSIONER DIAZ: Thank you, Mr. Chairman. I am going to try to attempt a difficult thing. I am going to try to put a question in here, see if we can drive this to what the Commission tries to achieve in being risk-informed, which means that we pay no significant more attention as the issues become more safety significant.

And so the question is -- and I'll ask you to please be brief in your reply -- is the physical risk from spent fuel pools three years after they were removed from the reactor, much smaller than in a reactor -- because I am trying to gauge -- because there are people looking at this. We want to be able to put this in risk base. Is the risk much lower, lower than the risk from an operating reactor?

MR. SHADIS: Long-term or short-term? Long-term, it is much greater; short-term, much less.

COMMISSIONER DIAZ: All right. Would you care to explain how can the -- if a reactor has a very high amount of radionuclides, it's in a confined geometry, difficult to cool, very difficult to access, very high temperature. How can the amount of fission products and the possibilities of them to actually being released in a major accident be more short-time or long-time than in a spent fuel pool?

MR. SHADIS: The experience has been that we don't see the reactor accident ongoing to the extent that the whole core is expelled. You have a containment in place, which you don't have on the spent fuel pool building. A spent fuel pool, now they are talking, typically contains, what, three and a half cores or more. So, the volume of -- the amount of long-lived radionuclides would be greater.

COMMISSIONER DIAZ: So you are basing it on the fact that the long-lived radionuclides are in the spent fuel pool in large quantities, although the physical conditions are different. Okay. Mr. Lochbaum?

MR. LOCHBAUM: I would have to say that the risk from a spent fuel pool is greater than an operating plant because we've spent thousands and thousands of hours and thousands of people have studied reactor accidents and, comparatively, we've only scratched the surface of spent fuel pool accidents, so it's a threat we don't understand as well, so we can't be prepared to deal with as well.

COMMISSIONER DIAZ: So your point is since we don't have a good handle on it, therefore, it is an unquantified risk.

MR. LOCHBAUM: That's correct.

COMMISSIONER DIAZ: It's not that it's larger, but it's unquantified.

MR. LOCHBAUM: That's correct.

COMMISSIONER DIAZ: All right. Mr. Beedle?

MR. BEEDLE: I think the risk is significantly reduced as time goes on, with the fuel in the pool. The source term is less. The ease with which you can mitigate is considerably simplified. It takes, as somebody pointed out, relatively little water to keep that fuel assembly cool. So, I'd say -- and we've got a lot of experience with fuel in a pool. Most of it is unattended. The fuel sits there and slowly decays in heat, and it is truly the basis for our dry cask storage system.

COMMISSIONER DIAZ: Dr. Powers?

DR. POWERS: Well, Professor Diaz, as you know, I'm constrained only to take positions here that have been taken by the ACRS, and have not addressed that particular question. So, I'm going to take --

COMMISSIONER DIAZ: Well, you can on record as personal.

DR. POWERS: The fact is that I don't know quantitatively what the risk is, but the factors one has to address are exactly those that the other speakers have laid down. You have a system that is not single-failure proof, doesn't have multiple lines of defense. On the other hand, it has a declining potential to have consequences, and the ability to mitigate any initiator that is not truly fully catastrophic is really quite high. And those are the factors that one would have to take into account in developing a good risk profile for that. And where it stands relative to individual plant risk, I'm quite certain that, as we find in all these things, it depends on the plant.

COMMISSIONER DIAZ: Excellent. So we've got four completely different answers.

DR. POWERS: No, I think you've got four very similar answers, and I would say that reflects the sort of consensus that showed up during the ACRS meetings on this. There was a consensus that we did not have a thorough phenomenological understanding and that there were plant specifics that could have a substantial bearing on the performance of the pool.

COMMISSIONER DIAZ: And long before we got to that point, I have written in my notes in here, you know, phenomenological understanding, which I think is where we really, you know, don't have a full, comprehensive study. It think the staff made a very, very good effort in trying to, you know, quantify the risks. However, you know, I see things that, as an old mechanical engineer, I'll do differently, and I'm sure that other people would, too.

But on the point of the possibility, which I agree with Dr. Powers, that really the issue is not whether it is possible or not because everything is possible under the sun, and you can, you know, establish whatever conditions you want to, but what is the risk and how good is the risk assessed or determined from, you know, as good a model as possible. And this is where I hear -- and I hear a consensus -- that we have not really grown to a point where we can say that this, you know, phenomena, at least all the ones that are important to risk, has been quantified to the point that a final answer can be given in what actions should be taken. However, it seems like from the risk perspective we have already taken a significant step forward and already been able to determine, you know, what are the most significant profiles. Is that reasonable? Let me start from Dr. Powers.

DR. POWERS: Well, I think the staff took a good scoping attack on this and did an analysis perfectly adequate to their intention, which was to address the risk significance of some emergency preparedness measures. And I think their analysis could be refined, but I think the conclusion is probably robust, that there is a point at which emergency preparedness measures simply don't have any impact on the risk comparable to the cost you may incur with it. And I think they probably have done a very good job of defining where the further analysis and examinations probably need to be done to reduce the uncertainties they have. They do come up with a conclusion that they are below their interpretation of the QHOs in this context, and so they don't see a great deal of imperative to give this high priority. I think that depends more on the kind of decisions you want to make and whether you want to do a comprehensive examination of the decommissioning issues.

COMMISSIONER DIAZ: Mr. Beedle?

MR. BEEDLE: I agree that, you know, the conclusion that you're below the QHOs is a very important one, and it does speak to the robustness of the analysis as well as the design that we're dealing with. But in doing that, we've taken this bounding sort of approach to get this into the realm of what I call almost infeasible kind of a process. You know, we've taken this extraordinary condition with this extremely unusual and unique kind of configuration in the plant in order to create the zirconium fire that leads to the ruthenium release. I mean, it's just a sequence of events that I think takes us

well beyond the realm of probabilities.

COMMISSIONER DIAZ: Mr. Lochbaum.

MR. LOCHBAUM: I guess I would disagree with Mr. Beedle in that I don't know that we're below the QHOs. I don't think this report answers that question because it didn't consider the sabotage risk at all. It didn't do, as Dr. Powers said earlier saying that it's less than 5×10^{-7} or some qualitative analysis that would allow it to be dismissed, to just --

COMMISSIONER DIAZ: With the exception of the security issue, you agree with the rest?

MR. LOCHBAUM: Well, the other issue that we're concerned about is -- the report says that not meeting those ten commitments or assumptions would drive the number up by an order of magnitude or greater. I don't know what "or greater" is. Is or greater three orders of magnitude? Since the report was done on conditions that don't exist in the country, I don't know if we're above or below the QHO line. We're probably not on it, but I don't know if we're above or below it.

COMMISSIONER DIAZ: Okay.

MR. SHADIS: The risk -- the probability has to be balanced against the potential consequences, and we don't have an adequate analysis of potential consequences.

COMMISSIONER DIAZ: So, fundamentally, the issue is what was the objective of the study, and was the study, as it was pointed out, is adequate to achieve decisionmaking by the Commission on the areas of emergency preparedness and security, and not that it is -- the study is the end-point for determining everything that needs to be done with a decommissioning plant. I think we need to, you know, consider the study not as something that answers everything, but it just provides answers in some specific areas where we can try to make the decisions on those areas and not take it beyond to what is not. It is not a definitive answer to every single question, but it does answer some significant questions in the risk area. It starts to put, you know, at least bounding, you know, scenarios on some of the major risks and, therefore, it has the value of being able to provide us with at least a much better, you know, answer to what we had before regarding what the risks are, and whether we are approaching or encroaching on the QHOs, which is a fundamental issue to the Commission. Therefore, maybe the issue for us is what is usable from the study, and how those parts can become, you know, more clear that does not resolve all the issues, but it's more -- and I realize that you have a significant question in the security area.

I'm about finished, I'm not taking too much time, but I do want to address, Mr. Shadis, the issue of how do we communicate or establish, you know, this is safe and unsafe. I am sure you understand that we try, as public servants, to do a good balancing act. We never want to understate the safety significance. We normally are conservative, however, we don't -- we just can't overstate it if it's going to be, you know, taking and putting people in situations in which the fear and the problems from overstating an issue is going to be harmful to the quality of life, and that's a difficult balancing act, and I can assure you this Commission tries as hard as they can to be as factual as we can, conservative but not alarming when we don't have to. Thank you very much.

CHAIRMAN MESERVE: Commissioner McGaffigan.

COMMISSIONER McGAFFIGAN: Mr. Chairman, thank you, and I can already tell this is going to be an unsatisfying briefing in the sense that I probably have more questions -- they grow exponentially as I listen -- and I'm not going to get a chance to ask them all, but let me start with Mr. Lochbaum.

You and I have talked in the past about this Part 72 notion. I don't understand it. I don't understand what Part -- we've got rules, for better or for worse, in Part 50. Most of the rules with regard to decommissioning plants are in Part 50, and I don't see what Part 72 does for you at all, other than giving you a hearing as a person, but I think Mr. Shadis would still want to hear, if the Part 72 involves terminating the Part 50 license in order to get to the Part 72 license, then I guess we've got two hearings, one about terminating the Part 50 license sort of part way through so that we can get to 72 where you want decommissioning to -- but tell me what, on God's green earth, Part 72 does for you, because there is nothing in Part 72 about any of this. There's nothing there.

MR. LOCHBAUM: Well, Part 72 has something in there about the safety of independent spent fuel storage facilities, which basically the spent fuel storage, whether it's in dry cask or wet pools, at a decommissioning plant is.

COMMISSIONER McGAFFIGAN: We gave Part 72 licenses, say, at Calvert Cliffs and Surry and whatever. And I don't think the conditions there are any different than at -- where there's an that happens to be at a Part 50 license like Maine Yankee is going to have. So, what did the Part 72 process get you at Surry -- there's a license renewal coming up at Surry or at Calvert Cliffs that you want because it isn't clear to me.

MR. LOCHBAUM: I'll compare the two. If you try to decommission under Part 50, then you're doing 50.59 evaluations for the process. And you're then taking safety analyses that were prepared to support a Part 50 operating license. It really never considered a decommissioning of the plant. That was never part of the realm of possibility when all the safety studies were done. And then you're evaluating under 50.59 changes what you're doing, demolishing buildings or using chemicals for cleanup or whatever.

COMMISSIONER McGAFFIGAN: But Part 72 doesn't speak at all about any of this. If I want to take a reactor vessel and I

have to decide how to take the internals out and all that sort of stuff that goes on, the really crumby, dirty stuff where people get REMS, there's nothing in Part 72 about that. So what does Part 72 do for you?

MR. LOCHBAUM: Under Part 72, you have to do safety analyses for the spent fuel storage methods that you propose.

COMMISSIONER McGAFFIGAN: But you're not doing anything about the reactor vessel. You're trying to decommission a plant. I've got a big reactor vessel still there. I've got to decide how to dispose of all the buildings, and I've got this spent fuel pool here. I understand Part 72 could deal with the spent fuel pool if it's in dry cask storage. I have not a clue how Part 72 helps me decommission the whole rest of this plant.

MR. LOCHBAUM: Because you have to -- when you look at that spent fuel pool storage safety issue, you have to look at it -- you can't do it in a vacuum, you have to look at it for the site that it's at. So, if you were planning to build an independent spent fuel storage facility next to an Air Force bombing range, you'd probably have to look at the potential for them missing and hitting your facility rather than their target -- or maybe your facility is their target, I don't know. So you wouldn't just look at the facility, you'd have to look at what's around it and what's going on behind it. So as you go through decommissioning, you'd still have to look at how you're going to get the vessel out, how you're going to get the steam generators out, how you're going to take the buildings down.

COMMISSIONER McGAFFIGAN: But Part 72 is silent on all of that. It doesn't say a word today or -- you're basically -- I just have a hard time with it because I think you're saying we need some rules as to how decommissioning should proceed that perhaps are laid out in more detail than they are at the moment. If you're saying that, I think I'm for that. I think that's what we've been trying to get to for several years here, so that everything isn't by exemption and ad hoc. You know, you have to transition to decommissioning tech specs. I mean, clearly, the operating tech specs don't make a lot of sense, so the staff has done a lot of work the last couple of years, having generic tech specs for PWRs and BWRs, you know, where they call it -- for the decommissioning state, somebody gave it a term.

MR. LOCHBAUM: South Carolina.

COMMISSIONER McGAFFIGAN: Was it South Carolina? Thanks. And there's a lot of other stuff that has to go that people have to make decisions on. The goal is to make rational decisions in a decommissioning framework, and I don't know what Part 72 helps.

MR. LOCHBAUM: At the end of the day when the vessel is wherever it's going to go and the steam generator is wherever it's going to go and the contaminant material is wherever it's going to go, the only thing you have left is the spent fuel.

COMMISSIONER McGAFFIGAN: At that point -- at that point, we may be in total agreement. At that point, you have to have something -- a regime that runs the spent fuel pool. The part I don't understand is all that other stuff that has to occur, why Part 72 helps you one iota. We have a framework in Part 50 that may be working, for better or for worse. It can be improved perhaps. But I don't understand, given that all of the language about decommissioning and how one proceeds, including using 50.59 evaluations, is in Part 50 and foresees all this stuff, and has been done at Trojan and places like that, if all you're saying is that the end-state you would prefer when they decommission and they are left because the nation doesn't have a repository with a spent fuel pool or a dry cask storage facility, is the sole remaining item at that site, if you'd like to see that under a Part 72 license, or you want to understand the regime where the Part 50 license will transfer to a Part 72 license, then that's fair. But as I say, I don't understand the rest of it.

MR. LOCHBAUM: It's not that we're envisioning the day the plant stops splitting atoms it should go to a Part 72 license, we see that there should be some transition period from Part 50 to an overlap, to Part 50 being canceled or terminated, or whatever the word is, and the only thing you have left is a Part 72 license, so that this would be a process for going from Part 50 which is designed for an operating plant safety, to Part 72 which was designed for spent fuel safety, and it would get you from Part 50 to Part 72.

Right now, the ability to have spent fuel at a site under a Part 50 license when the reactor is in a different state just seems the wrong end-point.

COMMISSIONER McGAFFIGAN: That, I think, is the end -- I may be using my entire time on this one point -- but that's the end-point and we can talk about that. I don't think -- I honestly, as I said repeatedly here, Part 72 tells me nothing about the dirty work of decommissioning and about taking the internals out and about disposing of the waste and getting the site to a 25-millirem all pathways dose level or lower -- if it's in Maine, perhaps lower -- and all that work has to be done, and then you end up with an SFP or a spent fuel pool because we don't have a national repository, and at that point you're saying you want it under a Part 72 license. We can talk about that. And you're talking about a transition, we can talk about that as well, and Yankee Rowe -- you know, there's nothing in the rules that requires them to go from a Part 50 general license to a Part 72 specific license. I think that's what your issue is. If that's it, we can talk about it.

I am bothered, I'll just say briefly, about the study's use of bounding analyses. I don't think the antigravity is the best item for Mr. Beedle to be using, but I think asteroid impacts occur -- you know, when we start talking about one-in-a-million-year earthquakes, clearly we've had asteroids hit earth and cause some real damage in recent memory, in the history of man, let alone in the past million years. And I don't know. The study really has -- what strikes me is that it has gone and pushed the limits to the point that we've finally found a problem, and so the old analysis that we used where we said a zirconium fire is not possible in some of the safety evaluation reports, is no longer true because it was never true, it was always possible at some low probability if you get a one-in-a-million-year earthquake, if you drop a cask and the fuel is in the wrong configuration, and a whole bunch of other things go wrong, then you can get a catastrophic emptying of the

pool, maybe, and we haven't quantified all that. But what we've done deterministically is prove that if lots and lots of things conspire against you, maybe you'll get a catastrophic accident. The question is, is that a place where I want to regulate because if lots of things go against me -- that asteroid can impact in the next 40 years, and we'd all be toast anyway -- but where should -- I think, Dr. Powers, you talked about we're not where we need to be in terms of making the decision as to where we regulate -- or was I understanding you right -- as to when we can say that this is not something that I believe, or we believe as a Commission, is a place where we need to be regulating. What sort of further analysis do we need to decide this is so low probability -- and, yes, there are large consequences of asteroids hitting, or large consequences and low probability -- but I am not going to spend a lot of time and effort on a risk-informed framework, driving up costs and issuing regulations about the subject.

DR. POWERS: I wouldn't want to be in the position of telling the Commission how to make decisions --

COMMISSIONER McGAFFIGAN: Well, go ahead.

DR. POWERS: -- but in this particular arena, if one was making a risk-informed decision on this, one would have a risk analysis that at its core was an attempt to be the best estimate and a substantial indication of where the uncertainties lay, and then one would weigh that against one's acceptance criteria. You know, the Commission has a bigger job than that because we set up our risk acceptance criteria saying we won't include the conditions of sabotage and acts of warfare on those things in evaluating this risk acceptance criteria but, in fact, the Commission has to sit there and factor that in in some mental gymnastics.

To do these analyses, I think what we're hearing from all parties is that right now the deterministic portion of it is to adequately understood enough to get a realistic assessment of the consequences for a range of accidents. I don't have difficulties looking at a range of probabilities for the initiators that can go out fairly far, as long as I remain in a conversion space, and I think you do in this case.

I think we also have other kinds of initiators beyond the earthquake and beyond the cask drop that would have to be factored into the risk analysis.

COMMISSIONER McGAFFIGAN: What are they? You said that before, but --

DR. POWERS: Oh, anything that reads to a loss of coolant, loss of heat thing --

COMMISSIONER McGAFFIGAN: Catastrophic through the whole thing -- I thought the fire hose we decided --

DR. POWERS: -- well, you've got to run the water -- and things like that, or simply human error actions that result in the removal of water from pools. There seems to be quite a litany of those.

COMMISSIONER McGAFFIGAN: Those are all quite recoverable, and yet that's --

DR. POWERS: It's quite recoverable, and in doing the risk analysis you're going to have to take into account the recovery potentials because what do you want to use the risk analysis for? You don't really use the risk analysis to say, boom, this thing is safe enough. You're going to use the risk analysis to say, okay, these things I want some control over, these things I want to ensure that they're in place, these pieces of equipment are going to be crucial so I'm going to demand some testing or some sort of surveillance on them, these other things are unimportant and consequently I have no regulatory interest in them.

COMMISSIONER McGAFFIGAN: I'd just pick up on one point that all the Commissioners have made to Mr. Shadis. I think we are doing a pretty good job trying to interact with the public, and I want to take exception to one of your remarks where you said you never saw a member of the Commission raise a concern with the industry about something that they proposed or where we thought things were worse. I think you were present at the REG Info Conference a couple of years ago when I told Corbin McNeil that we weren't going to do a license renewal in six months, and that that was impossible and not even good public policy.

I think you are well aware of the Maine ISED meeting we had here early in Commissioner Diaz' and my tenure, where the Commission reacted quite negatively -- positively in your sense -- to Ed Jordan and Ellis Mershaw's testimony with regard to the Maine Yankee ISED findings, I'm sure to the dismay of the licensee. And I could go on -- the COMED meetings with Mr. O'Connor when he used to come in here every three or four months and tell us how the COMED plants were doing or not doing.

So I think if you're familiar with this Commission and with the history of this Commission -- and I think it's true for all the Commissioners and I think it's also true for past Commissions before my time -- we are quite capable of differing with the industry if there's a problem, in our view, and I think you'd do well to believe that of us. If you don't believe that of us, then there isn't much use in dialogue.

CHAIRMAN MESERVE: Commissioner Merrifield.

COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman. First question directed toward Mr. Beedle. In the study, the staff -- I'm going to quote it -- "The Staff concluded the risk at decommissioning plants is low and well within the Commission's safety goals. The risk is low because of the very low likelihood of a zirconium fire, even though the consequences from a zirconium fire could be serious".

In your slides and on page 2, you say the study overstates risk. And so in terms of trying to reconcile that, I'm trying to understand the practical implications of the staff's conclusion that you're really concerned about.

MR. BEEDLE: Well, if you recall, in the early portion of that study, they provide some graphs that show that the risk of the fuel pool situation is comparable to that of a power reactor. And I would tell you that if that is, indeed, true, then the Commission needs to go back and take a look at the regulations that apply to that reactor pool.

So, you know, if the study stands as it is, I think it becomes an issue for the Commission to go back and reexamine the requirements that we have for the operation of our plants with the fuel pools alongside them. When the fuel pool represents as much of a risk as that power reactor does, then I think it changes the whole dynamics of how we operate these plants. Even though it's below QHO -- I mean, it may meet the safety goals, the fact that you've gone out to the extreme boundaries to do this calculation doesn't make a lot of sense to me, even though you say it doesn't represent increased risk to the public. But when you look at it and you see those curves -- when I saw those curves the first time, I said, this is a problem for us.

We need, as an industry, to go back and say to ourselves, if that pool is as big a risk as the power reactor, we need to treat the pool differently. And so then everybody is saying, "But, Ralph, that's not true, that risk doesn't really exist". They've gone out beyond reason in doing these calculations. And so that's why I say we've got to correct the record. You may have got an 80 percent on the test, but you're not going to get into grad school with that exam.

COMMISSIONER MERRIFIELD: I've looked through the list of the industry decommissioning commitments. I guess there's sort of two questions I have coming out of this. One is, this commitment No. 5, "Spent fuel instrumentation will include readouts and alarms in the control room or personnel station for spent fuel pool temperature and water level and air irradiation levels". That's one of ten, and there are a variety of others along there.

To what extent would those types of commitments, in your eyes, meet many of the accusations leveled against you by Mr. Lochbaum and others, and with always the fear of volunteering something and having it be made mandatory, do you have any sense of what this particular one, or all of these commitments in their totality, what kind of cost that would place on individual licensees? Have you calculated that or not?

MR. BEEDLE: When the issue of personnel, their interactions with the pool, what sort of watch standard, watch standard requirements, came up early in the study. We took a look at the various conditions within the fuel pool environment, and we added all those up and came up with a list of conditions that existed in these plants relative to the concerns that were expressed on human performance -- whether or not the level could decrease and be undetected, whether or not you had the ability to refill and so forth -- and in some discussion, those were characterized by an NEI staff member as commitments that the industry had to operate the plant's fuel pool in a certain fashion. And it turns out that some of these conditions were not in place at some pools, and so there was a variety but, in general, those represented the way the industry collectively was dealing with fuel pool.

I think in the case of Maine Yankee that those conditions became elements of his fuel pool operation, as did Connecticut Yankee. So we had expected that as a result of that discussion, that if you were going into a decommissioning mode, that those elements would be put in place. The cost was relatively minor. It wasn't something that the Chief Nuclear Officers were getting overly excited about. Characterizing was NEI's commitments versus the industry commitment, I think, is maybe a bit of a stretch, but we were the ones that articulated that set of requirements.

COMMISSIONER MERRIFIELD: Mr. Lochbaum, let me pass to yo on that very same question. There are a variety of commitments they have there. Are these ideas that you would feel comfortable with, and would they leave you with -- I know you've raised a lot of questions about spent fuel pools for a very long time -- would this address many of the concerns you've raised, do you think?

MR. LOCHBAUM: It would be one way to do it. The other way would be to do a report that didn't rely on those assumptions, base the analysis on the conditions that exist out in the real world -- either that, or make the real world match the assumptions in your report.

COMMISSIONER MERRIFIELD: In the real world, you've got a terrorist using a fire hose to drain a pool. Obviously -- I mean, that was in what you have --

COMMISSIONER DICUS: We resolved that with lock and key.

COMMISSIONER MERRIFIELD: Fire hoses under lock and key, I think, from a risk standpoint, wouldn't be a good idea either. What about No. 5, you know, the notion of having alarms and readouts to give you the temperature, the water level, the air irradiation levels, wouldn't that address some of the concerns that you have raised about these pools being left for some period of time and their being drained out events?

MR. LOCHBAUM: They would go a long way, but also begs the question of since these plants have operated for close to 40 years without some of these attendant features, why is it such a great idea to impose them now? It looks like it would be -- if it's a good idea, it's a good idea today as it would be for a decommissioning plant, because the spent fuel pool really doesn't know if the reactor is operating or not. You can ask it written questions or anything, it just doesn't know. So if all those things are good to reduce or properly manage the risk, they are a good idea today for every plant, not just the ones in decommission.

Having said that, just Friday we issued a letter to Region IV about an event at Palo Verde where they put too much water into the spent fuel pool out at Unit 3, and the spent fuel pool high level alarm did not function. So they had one, it just didn't work. And that's the only reason it's there, it's not there for any other reason, and it didn't work when it was needed.

If you go back and look at the events, as I've done when spent fuel pool draindowns occurred, frequently you'll find that the instrumentation that was provided just didn't work. I think that goes to a concern that Ray Shadis raised about being safety related and no backups. You know, this stuff can be put out there, but if you don't surveillance and test it, it may not work when you need it, and that seems to be the case.

COMMISSIONER MERRIFIELD: Let me keep going for a second. On page 11 of your testimony, the second point -- you know, if we have a shutdown plant, what can we do -- and I might remind you that we have acted in that respect, and you can ask the folks at Haddam Neck in that regard. In 1997, we issued a CAL, confirmatory action letter, against them in response to radiation protection deficiencies, and did not allow them to move forward in any activities until they addressed the issues in that CAL. I'm not expecting you to respond to that, but I would want to leave the impression that we do, in fact, have tools at our disposal to require activities of licensees even in the absence of having an operating reactor.

Dr. Powers, I wanted to briefly get your thoughts on the issue or reconciling the Lawrence Livermore seismic hazard curves with the EPRI seismic hazard curves. This is something you've raised in your letter of November 8th. It also seems to be something for which the staff hasn't raised as much for the staff to reconcile those, although I think Mr. Beedle and the folks at NEI have raised some concerns, too.

What is the issue here, and why is it important for us to come to some consensus on it?

DR. POWERS: The two sets of curves you speak of are expert elicitations on the seismic hazard where the discrepancies are between the two sets of curves are predominantly in the area of the East Coast earthquakes.

The processes by which the expert elicitations were done were different. They asked different questions of what amounted to rather similar sets of experts and so they got different answers and, as a result, two sets of curves came out, the Livermore curves being somewhat more conservative than the so-called EPRI curves.

The difficulty that the ACRS raised in their letter to you on this subject was that as long as this is allowed to persist, ipso facto they move to the Livermore curve and they become dominant and all your conclusions come from them.

So, what you're essentially saying is there's one element of the body of opinion on these seismic hazard curves that just doesn't get factored in. Yet, at the same time, the staff has set up the procedures by which a reconciliation could be done, and so the ACRS said why don't we do that so we no longer have this problem of neglecting the proper thread of technical opinion on something that is forever doomed to be in the area of expert opinion. That's all the ACRS is saying, is just go fix it. You know how to fix it, so do it.

COMMISSIONER MERRIFIELD: Thank you. Finally, Mr. Shadis, I noted your comment about the speed to which our staff has responded to some of the issues you've raised. I was reminded in 1986 and I got a wild hair and just decided I was going to, among other places, apply to Harvard Law School, and five days later got a letter back from them rejecting my application and starting with the line, "After careful consideration, we have decided not to offer you a place". So, I hear you on that, and obviously, from my standpoint, I think we should take the time and effort not only to review them and respond to them, but to consider the comments made by our stakeholders. So, I take that for future homework.

On the issue of -- you mentioned sort of the constant reassurance -- I agree entirely with Commissioner McGaffigan, I took a little bit of a different take at that, that you were referring not necessarily to the Commission, but to the staff and how they respond in public. I think the Commission is somewhat in danger of committing aversion therapy to our staff in that we've received some complaints that our staff goes out and they go to public meetings and they sit on their hands and they listen politely and they don't respond and interact with the public. And we have other situations where they go out and they listen and they respond and they engage, and then they get accused of trying to reassure the public too much.

As Commissioner Dicus said, this is a work in progress. We're going to continue to try to get to the right place, not too warm, not too hot, nice and medium, but we certainly appreciate your efforts in that respect. Thank you.

MR. SHADIS: Thank you. May I respond just briefly? In the written material that I've submitted, there's a number of examples of how this has gone wrong, but last time I came I got a lecture from Commissioner McGaffigan also, and I appreciate it.

COMMISSIONER McGAFFIGAN: Frank Miraglia is retiring, so I'm taking over the lecture-giving business.

MR. SHADIS: Well, I appreciate it, and in the spirit of this new, you know, willingness to exchange, I would like to have a real exchange about the realities of that Maine Yankee ISED process, which I'm very, very familiar with, and very, very unhappy about the way that the Commission conducted itself. And so I would --

COMMISSIONER McGAFFIGAN: I'd be happy to do that, whenever you want to do that.

MR. SHADIS: Thank you so much.

CHAIRMAN MESERVE: I'd like to thank the panel, appreciate their presentations this morning. We are running a little late -- well, considerably late. The staff is up for the next panel. Let me suggest that we take a three-minute break to stretch legs, and then we'll proceed with the staff.

(Off the record.)

CHAIRMAN MESERVE: Why don't we get underway. Staff is here for our second panel. Dr. Miraglia?

(Slide)

DR. MIRAGLIA: Good morning, Mr. Chairman, Commissioners. Today the staff will brief the Commission on the Technical Study for Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants. The study was recently completed and made public on January 17. The study has generated a considerable amount of industry from both the industry and public stakeholders, as evidenced by the dialogue of your previous discussions with the panel this morning.

The staff's presentation will attempt to address many of those issues, and we are prepared to respond to any questions the Commission may have subsequent to our planned presentation.

As was indicated, the study was undertaken to support development of a risk-informed technical basis for reviewing exemption requests and providing a regulatory framework for an integrated rulemaking for decommissioning plants.

The dynamics of the industry have shifted in the last couple of years, the act of decommissioning does not appear to be a short-term workload potential, as we had previously believed. However, the staff still considers it important to develop a long-term regulatory framework for decommissioning.

The report presented today is the result of a significant effort of the staff's technical working group on spent fuel pool risk, and it included not only staff from the Offices of Nuclear Reactor Regulation, but from Nuclear Materials Safety and Safeguards, and the Office of Research. The report evaluated the probabilities and consequences for an envelope of design and operating conditions at decommissioning spent fuel pools. The staff has concluded, as was stated, that the risk from spent fuel pools are low and within the Commission's safety goals.

The staff will move forward into next phases of the regulatory process which are the development of policy options for the Commission consideration on revisions to the regulatory framework for decommissioning plants, which can be supported by the technical and risk study.

The staff also concluded that it was not that it was not possible to establish a generic decay time beyond which a zirconium fire in a spent fuel pool could be precluded.

I'd like to interject a little bit relative to that point, and there seems to be miscommunication on certain aspects. I think lots of the technical comments you heard, I think the staff would be in agreement with. The issue that arises in terms of the policy consideration is one of process. When the staff came to the Commission in 1993, it talked in terms of using the zirconium fire and the preclusion of the zirconium fire as the basis for establishing exemptions for insurance purposes. The SRM talked in terms of a requisite time period for which that fire could not occur. So, it's a process issue that raises the policy question. I think the staff believes that the basis for the exemptions may have been stated differently. The technical report says that basis may be a little different, and the staff is prepared to go back and look at those exemptions and see if they can be justified on the basis of risk. The '93 paper was predominantly a deterministic kind of view.

The discussion also considered other low-frequency seismic cask drop events in the report, and it was not intended to emphasize -- either over-emphasize or under-emphasize -- their significance. Rather, they highlight as being risk-informing aspects of our regulatory structure which heretofore had not been risk-informed. These aspects of the regulations have traditionally been dealt with beyond design basis event, in terms of emergency planning and insurance. So, going beyond design basis is consistent with examining exemption requests in terms of insurance and emergency planning with beyond-design basis events.

The Commission and the stakeholders will need to consider certain policy issues before moving to the point of developing specific changes to our regulatory structure. As you will here, the staff is moving to developing such options on these issues and expects to provide a paper to the Commission by the end of May of this year.

With me at the table today, to my left, is Ashok Thadani, Director, Office of Research; to his left, Wayne Hodges, Deputy Director, Spent Fuel Project Office, NMSS; to my immediate right, Brian Sheron, Associate Director for Project Licensing and Technical Analysis, Office of Nuclear Reactor Regulation; to his right, Jon Johnson, Associate Director for Inspection and Programs, Office of Nuclear Reactor Regulation; and to Jon's right, Gary Holahan, Director of the Division of System Safety and Analysis.

If we can go to the second slide, please.

(Slide)

I'll try to go through these quite rapidly. I think many of these issues were discussed in the previous panel.

We did have many exemption requests early on with some of the premature decommissioning of some of the facilities in the areas of insurance, security and emergency preparedness, and we provided such relief on an ad hoc basis by the

exemption process.

As I've indicated, the zirconium fire was an important consideration in developing a point of reference in data for providing relief from insurance requests. We had, as was discussed earlier, several attempts at rulemaking, and that didn't progress, and the technical basis was seen to be inadequate. Next slide, please.

(Slide)

Industry has challenged the zirconium fire criteria. We had a meeting with the Commission in March of 1999. The SRM indicated we should go ahead with a risk-informed approach, and this technical study is the culmination of that risk-informed approach. The staff was committed to perform that technical analysis, and that's what we're here to discuss with you today. With that, I'll turn the presentation over to Brian Sheron.

MR. SHERON: Good afternoon.

(Slide)

I'm sure you're all aware the purpose of the study was to provide a technical basis that the staff could use for two purposes. One was to use as a technical basis for justifying any exemptions that were being requested by decommissioning plants, and the second was to provide a technical basis from which we could go forward with a rulemaking on decommissioning. Next slide, please.

(Slide)

We've had extensive interactions with our stakeholders. I think in my experience this has probably been one of the ones where we've had the most. We've had two draft reports that have been issued for public comment. We've had 15 different organizations or individuals provide comments. The last draft alone generated, I believe, 110 comments. We've held 14 open meetings with our stakeholders, and we've had five open agency meetings, two with the Commission, I believe two with the full ACRS, and one with the ACRS Subcommittee. Next slide, please.

(Slide)

Our approach. We tried to define a generic decommissioning plant and a spent fuel pool. Using that generic pool, we estimated the likelihood of fuel uncovery. In our analysis, we assumed that the pool level would drop to come within 3 feet of the top of the fuel, and at that point we did not continue our analysis. The reason we did that is because for slow draindown events, it takes hundreds of hours to reach that point, and the thought was that if there was no action taken by operators up to that point, there was a low likelihood that operators would take action during the uncovery phase.

Rather, what we did is start the analysis with a drain pool in which we then assumed a heatup. We looked at various parameters and we varied them. We looked at, for example, the thermal-hydraulic analyses. We looked at the decay time. We looked at different flume characteristics and a number of other parameters. Next slide, please.

(Slide)

As a result of those analyses, we were able to come up with the risks, and we compared those against the quantitative health objectives of the Agency and, as you've heard several times in this briefing, we are well below the QHOs.

We also looked at the benefits of emergency preparedness, and what we concluded that for the seismic event, the low probability seismic event, we found that the emergency preparedness did not have a lot of benefit after 60 days in which the fuel was decaying, and what we concluded was that consistent with Reg Guide 1.174 criteria, that one could in fact justify not having emergency preparedness requirements after the 60-day decay time. Next slide, please.

(Slide)

As I said, we received numerous stakeholder comments. These are just some examples which I think you've heard some already. One was a need to consider criticality, and we did in fact take a look at that. We evaluated it and again concluded it was not a very big risk contributor.

The concern about the seismic assessments, the difference between the EPRI and the Lawrence Livermore hazard curves, to address that concern, we analyzed the pool using both sets of curves, and what we found was that for the East Coast plants, with the exception of one, H.V. Robinson, all the plants again were well below the safety goals. And what we did conclude for Robinson Plant and for West Coast plants is that they would have to be analyzed probably on a plant-specific basis.

We also had a comment that we needed to consider some recent events that have occurred. These were some pools that have heated up. Browns Ferry heated up, I believe it was 25 degrees over a two-day period, and Duane Arnold heated up I think about 40 to 50 degrees over a two-and-a-half-day period.

We looked at these. Our conclusion was -- is -- that with the commitments, the industry commitments that we assumed in the analysis which includes things like periodic plant walkdowns every shift, temperature monitoring, as well as the long amount of time that would have to occur for heatup and eventual boildown to believe that this would not be detected, we think, was a very low probability. Next slide, please.

(Slide)

The conclusions and findings, which Mr. Miraglia has already mentioned, is that, again, the spent fuel pool accident risk is low, it met the quantitative health objectives, EP relaxation can be justified consistent with Reg Guide 1.174. Next slide, please.

(Slide)

I will emphasize that we looked at the seismic risk as well as the cask drop and so forth. What we concluded was that for these very low probability events, we are not saying that there is always a change of a zirc fire. What we are saying is that at these low probability events, we do not have enough information to a priori preclude postulating that there could be some configuration that could be achieved that would cause a zirc fire. We have not tried to quantify it, though, by putting probabilities on it.

We have identified some areas, and I think you've heard a number of those, where if we were to move forward and do more work on this report, areas we would look at -- obviously, you've heard about the seismic curves and some attempt to resolve those, but also some research on the source term in an air environment -- and Dr. Powers, I think, gave a good discussion of that -- would also be very useful.

The report did raise, as you've heard, a number of regulatory implications, and Jon Johnson will now walk you through those.

MR. JOHNSON: Good afternoon.

(Slide)

We took a look at the technical report and said what does this mean from a regulatory basis. We first looked at do we need to do anything immediately, and we decided no, there were not in any immediate safety concerns. The fuel in the spent fuel pools has been there for a sufficient amount of decay-time such that there's at least 20 hours to take action. We feel that there're some other reasons why that there's no immediate action. The low likelihood of a fuel uncovery event that would result in a significant radiological release.

The staff has granted exemptions based on sufficient cooling for all reasonably conceivable situations. Next slide, please.

(Slide)

There were three areas of primary interest. The first one I'd like to discuss is insurance, the Price Anderson Act. In 1993, the Commission directed the staff to approve a reduction in the insurance requirements after a requisite period of cooling had taken place. Mr. Miraglia mentioned that this was an assumption in that SRM that after this certain period, there was no chance of a zirconium fire.

The exemptions were granted in about ten cases, and these were granted both in the relief for primary and secondary insurance protection. The primary insurance protection for operating reactors of a given size is about $200 million per year, and this reduction was made to about $100 million, and there was also an exemption granted in the secondary insurance pool participation. This insurance pool provides $83.9 million per accident for a total coverage of about $9 billion nationwide. Next slide, please.

(Slide)

We also granted exemptions in security. These exemptions were based on the fact that there was no significant threat to public health and safety, no significant offsite consequences, et cetera. But the same basic premise was used, the same basic understanding of the inability to have a zirconium fire was used in those exemptions, although the exemptions themselves do not state that. Next slide, please.

(Slide)

Along with insurance and security, we granted exemptions in emergency preparedness, both the onsite and offsite plans. These were based on the fact that the doses from any reasonably conceivable accident would not exceed the EPA Protective Action Guidelines, and also that there was sufficient time to take mitigating actions. We felt that any of the emergency action levels would not go beyond an alert. If there was no real concern for an offsite release, then there would not be need to be any protective action recommendations offsite and, therefore, there was no emergency actions levels above the alert level.

The staff is coordinating with FEMA on these decommissioning policies, and we believe that any future rulemaking will have to take FEMA into account -- their views.

(Slide)

What are the next steps? We need to provide some options on what we believe is a proper approach on how to use risk, how do we apply risk thresholds to insurance, security and emergency preparedness. We need to provide a risk-informed, performance-based approach to the exemptions, and we also need to provide a recommendation for a similar approach for

rulemaking. Last slide, please.

(Slide)

In summary, we believe that the spent fuel pool accident risk is low. We don't believe that there's any immediate safety concerns. We do believe that we should provide some options for the Commission. We plan to provide those in a paper by the end of May. We anticipate Commission direction on that approach, and we plan on providing an action plan on the existing exemptions and on future rulemaking 60 days after that. This concludes our presentation. We're prepared to answer questions.

CHAIRMAN MESERVE: Thank you very much. Commissioner Dicus.

COMMISSIONER DICUS: Brian, if I could, you mentioned that you had evaluated, or staff has evaluated different plume characteristics, a possibility if we had a zirconium fire. Could you elaborate just a little bit briefly?

MR. SHERON: I think it's the driving energy for the plume. I think you heard Mr. Shadis talk about concerns about if roofing material, for example, fell in the pool and was -- you know, contributed. So it's really more the dynamics of the energy release, you know, of the plume characteristics. Gary, I don't know if you want to add anything on that.

MR. HOLAHAN: I think that covers it pretty well.

COMMISSIONER DICUS: Okay. So it wasn't the source term so much as --

MR. HOLAHAN: It's not the source term, it's the energy driving it. We looked at a range of about a factor of 10 and saw that it didn't make any difference in the long-term latent fatality estimates, and it made some difference in the early fatality estimates, but those are already pretty small.

COMMISSIONER DICUS: I want to pursue a little bit the emergency response issue. I believe on the slide, you mentioned that you had evaluated and were familiar with it, but you would only go to the alert level, that the driver would be at the alert level. And I guess maybe I don't have a question, but I have a comment.

With regard to the impact on offsite authorities, most, or many -- I'd have to go back and check now, it's been a while since I had to do this -- but offsite authorities will activate their emergency response plans at alert. Are you aware of that? So there is an impact.

MR. SHERON: Yes, there is an impact, and also even beyond that from an insurance standpoint, there may be even premature or preemptive type actions a State may take.

COMMISSIONER DICUS: Yes, because they will -- I know they will activate -- most of them, if not all of them -- at the alert level. And I guess the final quick comment or statement I would make, we heard the last panel, and nobody likes the study for various reasons, and they are all over the map on the reasons.

Would we benefit from a third-party peer review of the study? Frank, I'll put that to you.

DR. MIRAGLIA: I'll give you my view. Since you had four different views, I'll add a fifth view. Based on the range of views, I'm not quite sure that we would come out at a similar place.

You heard that the principal disagreement on EPRI and LLNL is expert elicitation, and I think given some of the uncertainties there, without a considerable amount of new research and new efforts to get better answers, I'm not quite sure that they'll provide a basis for making clear and cleaner decisions.

I think the report is bounding in some areas. I think in terms of the discussion on ruthenium, that issue came up in the context of discussions with the ACRS, and the staff looked at that in a bounding kind of way, from a small release of 1 or 2 percent to 75 percent, and again indicated that regardless of that it would be within the safety goals of quantified health objectives.

And so I think the staff has provided a technical report that gives you some risk insights and risk information, and I think we need to couple that with some other issues and provide some policy options for a sense of moving forward. My view is that much more time and effort should be put in on that.

COMMISSIONER DICUS: Thank you.

MR. THADANI: It seems to me that the report does lay out fairly clearly if the criteria to be used are the quantitative health objectives, then the analyses in a fairly conservative manner would show if yes, indeed, those criteria are satisfied.

I just want to separate two parts. One part is I think clearly there are conservatisms in the analysis, conservatisms in terms of particularly assuming 75 percent volatile ruthenium release, which has significant impact in terms of kid fatalities. In terms of latents, I think cesium is basically controlling, so the latent effects would still be quite significant.

Previous panel noted a number of questions, and I believe those questions are real. Is one going to have a fire? Fire, by the way, in this case, is sort of just local, you know, sparks or something, and the question clearly about will it propagate throughout the geometry of their spent fuel pool arrangement -- we don't know the answers. In fact, the consequences

may be significantly lower than what we're calculating.

I'm certainly not going into some areas that Frank and others have mentioned lack of data, that's why we're doing what we're doing, but the other piece that I think is not done in a bounding manner -- and I've heard that and I just want to clarify -- the seismic part in terms of two hazard functions has occurred that you've heard about, Livermore and EPRI, there were some differences in expert elicitation -- Dr. Powers said that. The Livermore hazard function was improved in 1993. Initially, they both came out in 1989, and there were significant differences.

I think we have additional data both in terms of seismicity factors as well as ground motion parts, those are the parts that go into the analysis. I don't know if we were to update it today which of -- my own view is, we probably ought to because we have a lot more knowledge and information. It's expensive to update them, but I'm not sure that the results are going to show the two curves come any closer. It seems to me that there may be a need, in fact, to also update the EPRI hazard function, and that has not been updated since 1989.

So, the two parts, there are clear conservatisms, and I think we acknowledge in the analysis where those conservatisms are and the kind of information that would be useful if we want to go forward and get rid of those conservatisms in the analysis.

And the other part is legitimate differences amongst the experts, and there are means available to us, if the Commission were to so decide, we could go forward and utilize much better expert elicitation techniques. So, that's two parts, conservatisms and real uncertainties.

MR. HOLAHAN: Could I just add one thought? I think the staff feels the technical study in combination with policy options provides a sufficient basis for rulemaking as was intended. If the Commission wanted the study to answer further questions, like a more realistic and a more thorough understanding of the phenomenology and where the risks really are, then I think it would benefit from additional review and peer review. So, it depends more, in my mind, on the intent of the use than on the study itself.

COMMISSIONER DICUS: Thank you, Mr. Chairman.

CHAIRMAN MESERVE: Commissioner Diaz.

COMMISSIONER DIAZ: Thank you, Mr. Holahan, that was very, very close to what I had in mind a while ago, but I couldn't get it across. You did it much better.

MR. HOLAHAN: Perhaps I stole it from your thought.

COMMISSIONER DIAZ: I hope so. First, I wanted to say that I think that Mr. Sheron's comments on slide 10 are very complete and very thorough because they actually put all of the conditions because, if not, things can be completely taken out of context. And so when the statement was bounding of what are the studies, what are the things, and I thought it was a very good statement.

I do have a little bit of problem with the phraseology, and I think it could be construed -- some people might think that the staff was trying to determine one day at a time the probability of a zirconium fire was zero, and I don't think that's what the SECY 93-127 intended in looking for to determine more precisely the appropriate spent fuel cooling period, which is what the Commission really needs. You know, we all know that if you postulate, especially in the calculation of certain numbers of things, you're going to get an answer that might not be realistic, but you get an answer. And in this case, you know, the answer that came out appears to be framed in those words, but really what the Commission has been asking, as Mr. Holahan just said, is, can we get enough information to be able to make policy decisions in the areas that we want, and if we need more definite answers, then I think it's obvious that the study is lacking.

But what we're trying to say from the risk analysis and from the phenomenological analysis, is it good enough. And I think it is reasonably good enough. But I think for public consumption, it's fair for me to ask this question because I think it's very clear. Would it be accurate to say that outside of the limitations of the model, that essentially determines what geometrical limitations there are, what the heat transfer is, whether I transfer heat from hot to cold or not, will there be a time, a reasonable time, where the amount of heat removal will be equal to the amount of heat generated? Somebody wants to answer that? Is it reasonable to expect?

DR. MIRAGLIA: I think the answer probably would be yes, but to pinpoint that time, I think, is where the staff would have difficulty.

MR. HOLAHAN: I think I would also say whether it's a quantitative model or a qualitative assessment, you still have to define the conditions under which you are making that energy balance.

COMMISSIONER DIAZ: That's exactly right. And that's exactly what the point is, is that the condition with the energy bounds are made needs to be clearly there. There is no doubt -- no doubt -- that in real life there will be a time, and there will be a temperature, which is the second parameter, at which heat removal is going to equal heat generation, there's no doubt about it because it's not an isolated system.

Now, if we were to postulate in the laboratory that the system is isolated and there is no heat transfer, there is nothing coming in, then that's a different story. But I think the point is you can come within reasonable assurance of saying -- it

might be ten years, or it might be some years -- but if you get a realistic model, you will be able to say that the amount of heat generated is going to be equal to the amount of heat removed, unless you are to insulate or postulate that there is no heat removal, and there is no doubt about it. The issue is what time and the issue is also what temperature because there is no doubt as the temperature increases, things are goign to happen. You know, heat removal is going to get larger, the temperature is also getting larger.

I don't think these things are clearly defined and that is a problem when we're trying to deal with the public understanding of these issues, and that's my real problem with the thing.

Let me go back to something that Dr. Powers said, and that is -- because the issue is not whether it is possible to find the time or not, of course it is possible to find the time. It depends what are your boundary conditions. It's just very simple. It is the issue that within the boundary conditions that were established in this study, it was not possible with the limitations of the model, limitations of the geometry, to find the time. But there would be -- if there is no time, there of course we are in deep trouble because then the laws of nature that we know of are in real deep trouble and they have to be reanalyzed.

Now, let me ask the same question I asked before, because I think it is an important question because it depends how we deal with this issue. From the standpoint of the phenomena and understanding of the phenomena, from the standpoint of the source term, the standpoint of the geometry, the standpoint of the spent fuel pool, all of those variables, is the risk of a spent fuel pool as large as an operating power reactor when it is at-power, or is it less?

MR. HOLAHAN: I'd like to take a chance at that. It's not my opinion, it's a matter of what the study shows. I think the study shows that the spent fuel pool risks are substantially lower than operating reactor risks. The curve that Mr. Beedle referred to can be somewhat confusing because there's a comparison of seismic risks to total risks from the spent fuel pool study. You have to recognize that in addition to seismic risk, the operating reactor has many other risk contributors, usually much more dominant than seismic. So, I would say the spent fuel pool, regardless of which seismic curve or whether you pick a high ruthenium source term or not, the spent fuel pool risks are substantially lower than operating reactor risks.

COMMISSIONER DIAZ: And to finalize, I think it would be important -- and I'm going to try to see how we ask that question, I'm sure it will come back to you -- the issue is. for what we need to do in the reasonable period of time, are the results of this study and experiences that the staff have because the study -- I mean, we're trying to put everything on one thing, and I don't think we ever do anything in this Agency based on one study. We need to balance it with everything else. The Commission will need to have sufficient information to determine whether what we have as of May is sufficient to lead us to a rulemaking that will provide adequate protection of health and safety, and I think that's fundamental. I think people are putting too much attention only to the study. The study is just one part of the many things that we know, and they need to be all put together in a manner that we can actually have policy decision. Thank you, Mr. Chairman.

DR. MIRAGLIA: If I may, Commissioner, I would agree with your last statement. I think the study is just one part and piece of information for a decisionmaking process. The issue that we have in terms of the previous papers that we sent to the Commission, they were not as risk-informed, and we looked at them in a different kind of way. And we have a difference between the technical studies. I often use a three-ring analogy when I talk to the staff, that we have a technical ring, a process ring, and then we have an environmental or atmospheric ring, and in the technical ring I think we know what the issues are, what the uncertainties are, and what the strength of the technical analysis is. Now we have a process -- trying to use this technical analysis and develop it in a process, and we have to look at what are the current rules and regulations out there for the facilities, and how should we change them for decommissioning. What has our experience been? And in terms of process, what we've done in the past with exemptions have looked at the zirconium fire in a very deterministic way and not fully risk-informed, and that raises the policy issue of how should we examine whether the basis for those exemptions preclude the fire as to whether it's sufficiently low in probability and safety consequences to go ahead. And I think that's something the staff will have to develop and provide to the Commission in the May time frame.

COMMISSIONER DIAZ: Thank you.

CHAIRMAN MESERVE: Commissioner McGaffigan.

COMMISSIONER McGAFFIGAN: Thank you, Mr. Chairman. I'll start off by just briefly thanking Frank Miraglia. I'm sure -- this may be his last briefing with us, if all goes well.

DR. MIRAGLIA: If all goes well.

COMMISSIONER McGAFFIGAN: Well, you know.

COMMISSIONER DIAZ: I should have known that before.

COMMISSIONER McGAFFIGAN: And I will never match Frank's ability to give lectures to people, including Commissioners themselves, but I've tried to learn a little bit about giving lectures, and we'll see how I do when Frank is gone.

I also want to -- I think Gary Holahan should probably get a thank-you from Sam Collins, behind him there, because if he hadn't given the answer he had given about relative risk, we would have been thinking about transferring NRR's budget to Mr. Hodges to work on the spent fuel risk, and so he probably deserves a kudo.

MR. HOLAHAN: That didn't influence my answer.

COMMISSIONER McGAFFIGAN: It's intuitively obvious to me that the risk has to be lower for a spent fuel pool than for an operating reactor, and it's just amazing the many orders of magnitude in my mind, but it's amazing we have to work to get there.

The paper we're going to get in May, in my mind, I won't know whether we have to redo the study or get peer reviews and whatever, until I see what you're going to make of the study in this policy options paper. Let me ask a question or two about the paper.

It's going to ask us policy options about the exemption process and the rulemaking process. We heard Mr. Beedle talk about Mr. Miller being told at a Haddam Neck meeting, we're never going to again grant exemptions based on this, and that's not what you're saying. You're saying we may have a different framework for granting exemptions in the future.

DR. MIRAGLIA: And I think in fairness, what we said -- and I think we've indicated this in some of the information we sent to the Commission -- given that there is this issue out there, exemptions in process need to have a clarification in the direction we're going.

COMMISSIONER McGAFFIGAN: But, see, that's one of the dangers. You're telling us today you're trying to come with the framework for granting exemptions. I could well see a staffer who is not as clued-in to what this paper is going to say, saying at a public meeting in Haddam Neck, or wherever this meeting occurred, that we're not going to grant exemptions in the future based on this study. That's a miscommunication.

DR. MIRAGLIA: That's fair, Commissioner, and I think any statement that starts out "Would you believe 1-or-2,000 people said this", and my answer would be yes. In terms of communications, we have communications initiatives internal and external, and not all the information flows downhill as rapidly or as completely as it should be possible.

COMMISSIONER McGAFFIGAN: In the May paper, if I'm trying to figure out, as a licensee, whether I'm going to get exemptions -- we don't have a lot of these folks about to decommission at the current time -- will I be able to see a framework in this May paper as to how exemptions are going to be granted, in security, emergency planning, and insurance in the future?

DR. MIRAGLIA: Jon could perhaps speak to that in a little more detail. My understanding is that we're looking at those three areas and developing --

COMMISSIONER McGAFFIGAN: Is it all going to be site-specific, or is there going to be a generic rule, or not?

MR. JOHNSON: What we're doing right now is we're looking at all the exemptions we've granted, and looking at what the implications are. This report has also raised some questions about how we treat security, as an example, for operating reactors. We also are looking at some guidance. We have regulatory guidance. And we're also working with NMSS for dry cask storage. So we're reevaluating all those options, and --

COMMISSIONER McGAFFIGAN: What glimpse of this are we going to see in May of this reevaluation? Will you have, by that time, determined whether a backfit to, I guess, take the exemptions back passes a substantial increase test and you're going to be recommending that we do that, or are you going to have determined that it couldn't possibly meet a substantial increase test and the exemptions --

MR. JOHNSON: I don't know what the answer is going to be, but I think we intend to provide some -- finish our analysis of what we have out there, look at the basis for our decisions, and see if we can still justify the exemptions we have, and see if we can still justify some rulemaking for efficiency purposes and provide the Commission some options and a recommendation. We don't intend to make --

COMMISSIONER McGAFFIGAN: You will be giving a recommendation in May with regard to the existing exemptions, is that correct?

MR. JOHNSON: We intend to. I mean, we think that it's beneficial because --

COMMISSIONER McGAFFIGAN: It will be interesting to see that. Has anybody looked at the international experience with decommissioning plants? France has decommissioning plants, Germany does, England does. Do they routinely grant exemptions? They may not have a Price Anderson equivalent, but for insurance and for emergency planning, et cetera, for decommissioning plants?

MR. HOLAHAN: I don't know the answer. We do know that because of fuel reprocessing, their spent fuel pool circumstances are somewhat different from ours, but I couldn't give you anymore information than that.

COMMISSIONER McGAFFIGAN: Some of those spent fuel pools in Germany, as I understand it, are chock-a-block because nothing has been -- this is for the operating reactors. Maybe for the decommissioning reactors, they've been able to move it out, but every time they try to move fuel in Germany, they have protestors protesting it, so I don't know.

Do you all have a sense -- Mr. Meisner talked about the Maine case. I mean, my sense is that we're going to end up with site-specific analysis every time. He mentioned that in his case he has bedrock underneath the spent fuel pool, which limits how bad things can get even in the catastrophic one-in-a-million-year earthquake or the cask dropping that you manage drive to catastrophic spent fuel holes here. Is that the sort of analysis that you someday are going to expect of

licensees, that they'll have to address these one-in-a-million-year earthquakes and extraordinary cask drops in order to say "in my particular circumstance, that risk is not there because I have bedrock", or because I -- Humble Bay, I guess, is sort of down underground, I guess it's got a lot of earthquake potential there, but it's also in bedrock. Are we going to have to have each entity come in for a case-by-case discussion of their particular circumstances in the future?

MR. SHERON: When we develop the rulemaking, that's one of the key issues we're going to have to look at, is if we do go to a performance-based, risk-informed type of rule, we have to weigh basically the cost of, for example, having every licensee do a plant-specific analysis for their particular site and so forth versus a generic rule. And I'm just thinking out loud by myself here, but maybe there's options where a licensee could follow a more generic approach which may be more streamlined, but they would still have the option of taking a plant-specific if there were unique features.

COMMISSIONER McGAFFIGAN: One of the bounding analyses, for example, you guys made on cask drop, it was -- you know, you found a pool somewhere where somebody had got all the hot fuel over on one side of the pool, and you basically said, "Oh, my gosh, if I drop the cask just so and it gets just into this configuration, my gosh -- and I don't allow any conduction, it's all air-cooling, then I can generate an accident", if I'm a licensee -- that's the generic study we have here -- if I'm a licensee, I can say, okay, if that's what I have to deal with, I can put my spent fuel pool in a configuration where that one ain't going to come up. But it just seems to me -- I mean, the thrust of my questioning is, we're going to do an awful lot of analysis out there in the 10^{-6} to 10^{-7} space to prove that I'm out there -- 10^{-8}, 10^{-9}, I'm not sure what the number is -- compared to all the other things we have to say grace over around here, it may not be the highest and best use of our analytical resources, or theirs.

MR. HOLAHAN: Can I make a few comments? What you said about the cask drop and the fuel in the corner, those are only examples of why it's so difficult to predict configurations and to do a heatup analysis. I don't think it was meant to say only in those specific cases do you have a problem, and so you can sort of shuffle around it.

One of the reasons the analysis is somewhat bounding is that it is meant to cover a generic situation, and if we could show that the risks are sufficient low and the issues are sufficiently unimportant, that could lead you to a relatively simplified rule with very little analysis, maybe even no analysis.

COMMISSIONER McGAFFIGAN: We were once hoping for two-year rule for BWRs, a three-year rule for PWRs, but apparently we're not going to get there is what you're telling us.

MR. HOLAHAN: No, I didn't say that. I'm not sure the study says that. I think, in part, it depends on the Commission's reaction to the policies. What level of risk are you trying to protect against? And whether it's complicated or simple, also depends upon where the guidelines or thresholds are set.

MR. THADANI: May I just add to Commissioner McGaffigan's point. In terms of the seismic initiator, I keep hearing this one-in-a-million earthquake, I just want to go back and again emphasize it's a distribution, frequency of various types of earthquakes with different spectral accelerations.

In the study, the staff also looked at the fragility characteristics of the spent fuel pool, and did assign -- given the kind of acceleration that the pool might be exposed to, they assigned some conditional probabilities of pool failure. So, it's really compiling various pieces of information together. And I just don't think it's correct to say this one-in-a-million earthquake, I think it's more than that.

MR. HOLAHAN: At the risk of stretching out a little longer, Mr. Beedle's graph of the seismic contributions I think was perfectly normal, and what it showed to me was that structures are designed well, that's why they don't fail at their design condition -- in fact, double their design condition, they are not very likely to fail. And so the contributions to failure always come substantially above the design value and then taper off as the probabilities go way down. So, it wasn't alarming to me, I think it's the normal expectation for a seismic curve. The question is, should you truncate that curve at some point because you're not interested in risks below 10-to-the-minus-something.

CHAIRMAN MESERVE: Commissioner Merrifield.

COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman. Before I begin my questions, and at the risk of embarrassing him, I'd like to join Commissioner McGaffigan in thanking Frank Miraglia for his years of service to this Commission. Frank was here as a staffer to the Atomic Energy Commission and has been here throughout the entire history of the NRC. Although the public may not appreciate it, Frank was one of the key staffers in the Rogavin report that led to many of the recommendations to improve the way we do business here at the NRC, and that was an important milestone in his career and an important part of our history here at the NRC.

More recently, he is a little bit more widely known for his efforts in the Y2K effort last year, in attempting to make sure that everyone -- not only we did the job right, but that was well articulated to the public and to the media. There are many, many things that Frank has done in between that were done with excellence and certainly I do want to again thank him for a terrific level of service during all of the years you've spent here at the NRC.

DR. MIRAGLIA: Thank you, Commissioner, I appreciate your kind remarks. thank you.

COMMISSIONER MERRIFIELD: With that, I'll take one last opportunity to harass you in public.

DR. MIRAGLIA: Please be kind.

COMMISSIONER MERRIFIELD: I always am. We talked a little bit -- actually, the first one is directed to Jon Johnson. Where are we right now -- you mentioned about FEMA and wanting to have a better idea down the line where we account vis-a-vis their concerns, but where are we right now relative to FEMA and some of the issues they may or may not have relative to the information of staff? It seems to me this is quite important, and the Commission obviously wants to be kept very well aware of the concerns of our sister agency, so if you could walk through that briefly.

MR. JOHNSON: I would say probably the best way to characterize it is preliminary discussions. I think we have, in the past, had interface with FEMA on general emergency preparedness regulations, but in issuing these exemptions I don't think we interfaced with them as much as we are now based on receiving this report. So, when we got this report, we took a look at it and said what are the implications for us, and because we've had many interactions with FEMA right now on potassium iodide and some issues at other plants on emergency preparedness, we've used this opportunity to meet with them and discuss this report, and I would just characterize it as preliminary discussions.

COMMISSIONER MERRIFIELD: Hopefully, those can be continuous and fruitful. In reading the report, one of the very brief, one-liner conclusions was based on a belief that we need to reconsider some of our concerns regarding ISFICES. That was a conclusion -- there wasn't a lot to back that up in the report. And I'd like to get some detail about where you guys are going on this, and if this is something that we really need to be concerned about.

MR. HODGES: As regards to the zirc fire, for example, that was a major contributor for this study, for earthquakes and similar type of events, the probability of zirc fire is extremely low, would be much lower than I think we show in this report.

The cask is designed to be seismic for fairly high level -- it's designed to take drop and tipovers at much higher accelerations even than you get for the very low-frequency seismic events. Most of them, they either are welded shut or they have bolted, sealed closures that are very robust and inerted. You have to get rid of the inert environment, for example, to have a problem on that. You have only a small amount of fuel in each cask compared to what you would have in a pool, and so you have a much lower heat source, and a design to remove heat primarily by radiation. If you changed and eliminated some of your convection or conduction, radiation is still a very good mechanism, very efficient, and so you raise the temperature a few degrees and it goes up to T^4, so you still remove the heat without getting very high temperature. So, it's difficult to get to the same kind of points in --

COMMISSIONER MERRIFIELD: So as a bottom-line concern then, given what's come out of the report and your understanding of those issues, would you say that we, in fact, don't need to reassess how we go about rating ISFICES as a result of this report?

MR. HODGES: Absent safeguards types of considerations, I would think we're in pretty good shape. As far as the safeguards themselves, that's being relooked along with everything else, and so we'd like to first see what the threat is that we need to worry about. That's an ongoing study. We do have a PRA that's being done by the Office of Research for us, to try to better characterize what the risk is in dry cask. Our expectation is it's going to be low, but that work has been in progress for eight or nine months now.

COMMISSIONER MERRIFIELD: Just so that it's not lingering out there, and I know I've had a prior briefing on this, there aren't any -- necessarily any lingering concerns about safeguards issues, some of those issues are not appropriate to discuss in a meeting like this, is that what you meant to characterize there?

MR. HODGES: Well, it's not appropriate to discuss at this point, but if given the type of threat we've looked at, we don't see any immediate threat.

COMMISSIONER MERRIFIELD: You don't see any threats from a safeguards perspective. Thank you.

We had some discussion earlier about some of the commitments that NEI has been talking about, or that the industry has been talking about, on decommissioning commitments. Mr. Lochbaum, in his slides, raised a concern about our being able to enforce against those or being able to keep NEI or its members to those commitments.

What's your basic reaction to those and where we may go from here?

DR. MIRAGLIA: I think in the report itself, the staff recognizes that it would have to go back and look at those commitments in some sort of regulatory context, but the use of voluntary commitments by the industry is not something that we haven't considered in the past. The Commission has directed the staff in performing regulatory analysis, to recognize what those commitments are and to give credit, and that's what we've done within this study. So, I don't see -- it's an issue that would need to have to be addressed, we'd have to close the loops on those things there, but I don't see it as a bar or does it preclude us from taking appropriate action if need be at any point in time.

COMMISSIONER MERRIFIELD: The following question is directed towards Ashok. You mentioned earlier, in response to another question, that there were some concerns you had raised about some of the conservative assumptions that were made in the study. Now, I have no problem with that, I think it's healthy for the staff to have a good interaction and debate these issues, but can you highlight briefly where the most significant differences are and how you -- and Frank also, if you want to chip in on this -- how you might intend to address those going forth?

MR. THADANI: I guess if you interpreted what I said as difference between the staff, I don't think there is any difference.

In fact, these issues are discussed, and the types of conservatisms in the analyses are discussed in the report itself. So what I said is not new, except to note that there are a number of conservatisms in the analysis, and I would agree with Ralph Beedle that there are, but that's the state of knowledge that we have today. In spite of those conservatisms -- in spite of them -- the results of the analyses show that the risks are lower than the quantitative health objectives. And if you thought I said anything different than that, then maybe I misspoke. There are no differences in our research on that issue.

DR. MIRAGLIA: In fact, I think it was Mr. Beedle that raised the issue that perhaps all the staff did not agree with the study. In fact, I think he even made allusions that it was just a small working group. This working group -- it was a working group product, with significant interaction with public stakeholders, with significant management review, and it does constitute the report from the staff to the Commission and which the technical recommendations are going to be based upon. So, I think Ashok is right, I think the issue comes to is there conservatisms, and what does it take to close the gap, and is it worth investing that additional time, as Commissioner McGaffigan spoke, to provide the basis for more focused decisionmaking in all areas or not, and that's what the staff is going to take a look at and provide some recommendations to the Commission in May.

COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman.

CHAIRMAN MESERVE: Thank you very much. Let me say on behalf of the Commission that we echo the words that have been said by both Commissioner McGaffigan and Commissioner Merrifield, that all of us very much appreciate the wisdom and thoughtfulness that you have brought to our deliberations over the years, and very much appreciate your efforts.

DR. MIRAGLIA: Thank you.

CHAIRMAN MESERVE: My final act of kindness to you, the staff and to the audience is to not present any questions today.

DR. MIRAGLIA: It is greatly appreciated.

MS. CYR: Mr. Chairman, if I could make a comment -- there was a document passed out in the middle of the meeting from Diane Cyr, which appears to address matters specifically in the Shearon Harris case. So, given that, it should not be considered with respect to anything on Shearon Harris, but the Secretary will serve it on all the parties to that case. Thank you.

CHAIRMAN MESERVE: Thank you very much. With that, we are adjourned.

(Whereupon, at 1:25 p.m., the meeting was adjourned.)