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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

THERMALHYDRAULICS SUBCOMMITTEE

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MEETING

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WEDNESDAY

JUNE 23, 2004

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ROCKVILLE, MARYLAND

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The Subcommittee met in Room T2B1 of Two White Flint North, 11555 Rockville Pike, Rockville, Maryland, at 8:30 a.m., Graham Wallis, Subcommittee Chair, presiding.

SUBCOMMITTEE PRESENT:

GRAHAM WALLIS	Subcommittee Chair
F. PETER FORD	ACRS Member
THOMAS S. KRESS	ACRS Member
VICTOR H. RANSOM	ACRS Member
RALPH CARUSO	Designated Federal Official

NRC STAFF PRESENT:

RALPH ARCHITZEL	NRR
DAVID CULLISON	NRR
ANTONIO FERNANDEZ	OGC
JOHN HANNON	NRR
DONALD HARRISON	NRR
ANTHONY HSIA	RES
B. P. JAIN	RES
MICHAEL JOHNSON	NRR
MARTIN MURPHY	NRR
DAVE SOLARIO	NRR
BRIAN THOMAS	NRR
LEON WHITNEY	NRR

ALSO PRESENT:

TIM ANDREYCHEK	Westinghouse
P. BLOMART	Electricite de France
BOB BRYAN	TV1
JOHN BUTLER	NEI
JOHN CAVALLO	CCC&L
JOHN GISLON	EPRI
BRUCE LeTELLIER	Los Alamos National Lab
LEETAI YANG	Southwest Research Institute

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P R O C E E D I N G S

(8:34 a.m.)

CHAIRMAN WALLIS: Good morning. I wish to open the second day of the meeting of the Thermalhydraulics Subcommittee of the Advisory Committee on Reactor Safeguards. We have the same membership as yesterday. And we have the same designated federal office, Ralph Caruso.

We will continue our discussion of Generic Safety Issue 191, Pressurized Water Reactor Sump Performance. And I invite NRR to tell us about the Generic Letter.

MR. CULLISON: Good morning. I've Dave Cullison. I'm with the Plant Systems Branch. And I'm here to present the GSI-191 Generic Letter.

The purpose of this presentation is to obtain ACRS endorsement of the GSI-191 Generic Letter.

A little background, last year you were briefed on a proposed Generic Letter for GSI-191. That Generic Letter was subsequently broken into two parts, a bulletin to address immediate concerns and the Generic Letter to ask more detailed questions on compliance.

In June of last year, the staff issued Bulletin 2003-01, which asked addresses to either

confirm their compliance with 50.46(b)(5) or implement compensatory measures to reduce risk. At the time, the staff realized that it may be necessary for addressees to undertake complex evaluations to determine whether regulatory compliance exists in light of the concerns identified in the bulletin.

So the bulletin said that a Generic Letter would be issued later. This is the follow on Generic Letter.

The staff's conclusion is that the issuance of the Generic Letter 2004-XX will confirm the continued compliance with the long-term cooling requirement of 10 CFR 50.46 by addressees in light of the new information coming from the efforts to resolve GSI-191.

The proposed Generic Letter was issued for public comment at the end of March of this year. The comment period ended June 1st.

These are the external stakeholders who provided comments. These are major issues coming from the external stakeholders. These comments and those of internal stakeholders were factors in determining what changes to the Generic Letter should be considered.

The final disposition of the comments is

still under review by the staff.

Several industry comments -- we had some -- several industry comments on making the Generic Letter more action oriented, similar to the Bulletin 9603. Bulletin 9603 dealt with the strainer clogging for BWRs.

We also had external stakeholder comments on an emphasis on compliance in the Generic Letter. The Union of Concerned Scientists said that the NRC must either require compliance determination or abandon its risk-informed regulatory initiatives.

And comments from industry included that we approached the Generic Letter from a denying-basis standpoint and that the methodology, the NEI methodology is too conservative for compliance confirmation. And the plants already complied with their current licensing basis.

We also had comments on the backfit, that the draft Generic Letter -- this, in case you all don't know, the draft Generic Letter was not a backfit and the industry believes the Generic -- the information requested in the Generic Letter was a backfit.

We also had numerous comments on the schedule and basically that the time line does not

provide for enough time after issuance of the letter to respond.

Based on the comments from the internal and external stakeholders, the staff is considering making changes to the Generic Letter in these areas.

The purpose of the Generic Letter, the requested actions, and the requested information, and the backfit determination. There's more discussion on these areas in the following slides.

CHAIRMAN WALLIS: I'm sorry, even though the red light is on, you said the staff is considering changes?

MR. CULLISON: Yes.

CHAIRMAN WALLIS: So what are we reviewing?

MR. CULLISON: The reason we are saying is considering changes is because the letter has not be signed out by management yet.

CHAIRMAN WALLIS: So how can we endorse a letter we don't know what it is?

MR. CULLISON: What changes that may occur after the version you've seen are primarily going to be process changes and not technical content changes.

MR. JOHNSON: This is Mike Johnson from NRR. I tried to talk about this a little bit

yesterday. We've raised these changes up through management and have their buy in with respect to the approach.

I can't say they've seen the actual words and so you'll see maybe some tweaks in the words and not just some tweaks in the Generic Letter that we will be revising. You won't see tweaks in the concepts because we think we've gotten those concepts reviews. And so Dave is presenting those for the concept changes basically based on the comments that we've had.

CHAIRMAN WALLIS: So if we do see tweaks in the concepts, can we withdraw our endorsement?

MR. JOHNSON: We would certainly let you know if there are tweaks in the concepts. We don't believe that there will be.

CHAIRMAN WALLIS: I'm sorry. Go ahead.

MR. CULLISON: A driving consideration for the Generic Letter has been to propose staff position on improving the current licensing basis analyses to better model sump performance.

The proposed new position states that the staff has determined that in light of the new information identified during the efforts to resolve GSI-191, the previous guidance used to develop current

licensing basis analyses does not adequately and completely model sump strain debris blockage and related effects.

This new information, had it been known at the time, would have been included in the original guidance. As a result, the staff is revising their guidance for determining the susceptibility of PWR recirculation sump screens to the adverse effects of debris blockage during design basis accidents requiring recirculation operation of the ECCS or containment spray system.

The revised guidance is that the staff would like addressees to perform mechanistic analysis to show adequate NPSH margin across the sump screens.

The proposed purposes of this Generic Letter are request that addressees perform an evaluation of the ECCS and CSS recirculation functions in light of the information provided in this letter and, if appropriate, take additional actions to assure their compliance with 10 CFR 50.46(b)(5), which requires long-term core cooling in existing regulatory requirements listed in the Generic Letter.

And this is a change to the Generic Letter that is being considered. This change is related to the new staff position that existing analyses need to

be updated to reflect the information coming out of GSI-191.

This change also responds to external stakeholder comments wanting a more action-based Generic Letter.

And the other purposes are request that addressees submit information as required as specified in this letter to the NRC to confirm compliance with 10 CFR 50.46(b)(5) and require addressees to inform the NRC of the extent to which they will take the requested actions and require addressees to provide the NRC a written response in accordance with 10 CFR 50.54(f).

And then these are the regulatory requirements that form the basis of the Generic Letter.

CHAIRMAN WALLIS: Did you just flash that slide so that we couldn't see it?

MR. CULLISON: No. I'll give everybody a few minutes to look at those.

CHAIRMAN WALLIS: Okay.

MR. CULLISON: A major change being considered is the request that addressees perform some actions to confirm their compliance to the regulatory requirements listed in the applicable regulatory

requirement section of the Generic Letter.

Specifically, the staff is considering requesting that addressees perform a mechanistic analysis using an NRC-approved methodology of the potential for the accumulation of debris to impede or prevent the recirculation functions of the ECCS and CSS following all postulated actions for which the recirculation of these systems is required.

The staff is currently reviewing the NEI baseline methodologies, which you were briefed on yesterday.

MEMBER KRESS: Would that be the NRC-approved methodology?

MR. CULLISON: Yes. At the time, that's -- right now that's our approved methodology. The addressees have the option to use alternative methodologies to those already approved by the NRC, however, additional staff review may be required to assess the adequacy of such approaches.

Additionally, the staff is considering requesting addressees to implement any plant modifications that the above evaluation identifies as being necessary to ensure the compliance with the NRC regulations.

CHAIRMAN WALLIS: Why would you put out

the letter before the methodology? What would be the purpose? One doesn't do anything until they've got something to use.

MR. CULLISON: With the Generic Letter going out first, it gives everybody an advance view of what we are going to be requesting. And there's only a 30-day gap between the time the Generic Letter is issued and the methodology.

CHAIRMAN WALLIS: But you are assuming the methodology will be okay.

MR. CULLISON: That is the assumption for this Generic Letter.

CHAIRMAN WALLIS: So you have great pressure, you're under great pressure to accept the methodology whether you like it or not.

MR. CULLISON: I don't think we're so schedule-driven that we would accept bad product and put out an unsafe methodology.

CHAIRMAN WALLIS: And now we can ask real questions.

MR. CULLISON: Okay.

MEMBER FORD: Could I go back to your answer to Dr. Kress? This approved methodology, this is not Reg Guide 1.82 is it?

MR. CULLISON: No. When we're --

MEMBER FORD: So this approved methodology is -- what was your answer to Dr. Kress?

MR. CULLISON: The NEI methodology that was briefed yesterday --

MEMBER FORD: Okay. The NEI?

MR. CULLISON: -- which we are reviewing and will issue an SE --

MEMBER FORD: Oh, okay.

MR. CULLISON: -- that's going to be the -- so the time that the Generic Letter is issued, that's the proposed method.

MEMBER FORD: So it's your approval of the NEI methodology?

MR. CULLISON: That's correct.

MEMBER FORD: Which doesn't have any chemical effects?

MR. CULLISON: That's right.

CHAIRMAN WALLIS: So that if you implement planned modifications before the chemical issue is resolved --

MR. SOLARIO: Dr. Wallis, Dave Solario of the staff, in cases where we don't have a lot of data like the chemical effects, we're obviously going to have to ask licensees to, on a plant-specific basis, propose solution.

Consider, though, that by the time they'll be having to write their responses to the Generic Letter into us, they will meet and they will have to have the benefit of the results of the research at this time.

CHAIRMAN WALLIS: This is very interesting. This is more like a football game than the regulation. I mean you've got to move pretty quickly and dance around and pass and fake and all kinds of stuff in order to keep up with the new information as it comes in.

MR. SOLARIO: I'm not sure I would use those words but we're working to try to have the information available to industry and ourselves in time to be able to use --

CHAIRMAN WALLIS: But certainly, I mean -- well, I said that to illustrate. This is a dynamic situation. It's not something where it's quite clear that this happens and then this happens. You've got to be prepared for new information, which might be surprising. And then you have to react to that.

MEMBER KRESS: I think this includes --

CHAIRMAN WALLIS: But as long as you know that's the game you are playing then --

MEMBER KRESS: I think this includes the

downstream effects. You haven't really settled on what to do about those either, have you? The potential for penetration and blocking the housing?

MR. SOLARIO: Well, when I say -- I try not to use that word, but we do have some experience looking at the issue with Davis-Besse. We are currently thinking -- putting our thoughts down on paper about how we would evaluate a response from a licensee with how they're addressing that.

Our safety evaluation report endorsing the NEI methodology would obviously have to outline some guidance to licensees on how they would want to come in, discussing how they would address the issue.

So as Mr. Wallis said, the dynamic processing, we're working on.

MEMBER KRESS: Well, you know, I was looking for an approved methodology. And I didn't see anything about that in the NEI methodology.

MR. SOLARIO: For the downstream? There's not. It's not there yet.

MEMBER KRESS: So that's part of the dynamic issue, I guess?

MR. ARCHITZEL: I guess I'd just add on to what -- Ralph Architzel from the staff -- it's exactly as Dave said. We are preparing in not only the

downstream area but other areas as well.

We say approved methodology. What we're talking about is NEI has given us the baseline. And we will amplify in areas or state differences in different areas depending on what we feel is an acceptable approach.

This is very similar to what we've done in the BWR URG Safety Evaluation Report. That was not a clean safety evaluation report. There would be methods and then there would be differences. And staff would say here's the baseline. This is the way the staff considers an acceptable approach.

In the case of the downstream, and Steve Uwikewicz is here, he's been working with us, he's from the Division of Engineering, he could speak to this perhaps.

But we are developing additional guidelines to provide licensees that we would consider acceptable to endorse in this safety evaluation. And they're more detailed aspects than what are in the current NEI proposal.

A difficulty with the NEI proposals, they said this is an open area where they're still working on issues. We had a cut off date for when we would accept to write our SE. If we do get information,

we're going to consider it. But right now, NEI had indicated that's an area where additional work in ongoing.

But in the mean time, we're moving forward and it's not quite as high level as what was provided in the NEI section on downstream blockage. If you want, Steve could maybe amplify.

But the general approach is along those lines. It's not strictly the baseline. It's not strictly the NEI guidelines. It's the NRC safety evaluation taken together with that and how we address differences is the product we're looking for.

MEMBER KRESS: Well, the NEI methodology had the baseline but it also had refinements to the analysis. Would that be part of the approved methodology do you think? Or --

MR. ARCHITZEL: Yes. We're going to address -- we're trying to clarify, as Angie said yesterday and Bruce said, in the areas where it's pretty clear that baseline -- overall the conservative nature of the baseline, we're comfortable with that.

But when you get into the refinements, which are the specific refinements that are being allowed, we're going to pass judgment on those individually. And we have to look at how they fit in.

Some yes, some no. It depends. We're really doing -- that's where a lot of the effort would be focused.

If you can step back and say the baseline seems sufficiently conservative, then it's a question of how you implement those refinements and that's the difficulty we're faced with right now.

And there is thought about requiring the plant-specific -- like Dave said, in the chemical area, we're not finished on that yet. There's one thought about making a plant-specific submittal.

And there's another thought that would say that you should ensure you have sufficient conservatism so when a result is known, that it has been covered. So that's a letter that we've been thinking of sending to licensees reporting the safety evaluation. The other alternative would just be to defer it to plant specific.

So that's still under review at the moment on the chemical.

CHAIRMAN WALLIS: Could we go back to your slide -- on your Slide 4, it talked about the major issues that were raised. And at that time, we were quiet, didn't ask questions.

MR. CULLISON: Okay.

CHAIRMAN WALLIS: I noted that quite a few of the comments from industry took a legalistic tone and said you can't do this because you're requesting compliance outside the licensing basis.

You have to do something about the licensing basis of these plants. And there were several comments about the licensing basis and the need to change it.

And there were quite a few comments about the backfit rule. That you have to go through all this 5109 procedures. And you can't just seek compliance without going through all that stuff.

Are you sure that you understand all the legal implications? I'm certain I'm sorry I don't. But I noticed there were quite a few legalistic arguments that were raised by industry.

MR. CULLISON: And I believe we do understand it. We are also involving the Office of General Counsel to get a -- as you said, a lot of the comments were legalistic sounding so to make sure that we fully understand them and their implications, we've involved OGC early on.

CHAIRMAN WALLIS: You know it is strange the way the original draft says time after time we're not requesting a backfit.

MR. CULLISON: Right.

CHAIRMAN WALLIS: This is not a backfit, you know.

MR. CULLISON: Yes, we --

CHAIRMAN WALLIS: And then that's all this appeared now. And now it probably is a backfit in some form or other as a compliance factor rather than --

MR. JOHNSON: We always had a decision to make with respect to how we were going to proceed on this issue. And we've got some recent history in Generic Letters where we request information and then leave it to the licensee to provide that information.

And in this case, I think the industry was saying you're asking for information but that information, in fact, is causing us to do an evaluation and the industry do an evaluation against standards that are different.

And so why not first of all request the action and also why not recognize that we're raising the bar, I think was the words that were used in that meeting. And so that's what the staff has had to consider.

To be quite honest, I think -- and Dave is going to talk about it perhaps more, where we're

coming out on this issue, but we certainly are requesting action. We do want the industry to do this evaluation using the new criteria. We want them to identify any vulnerabilities and propose a plan.

And so that does seem like a straightforward approach. And so I think we understand the spirit of the comments, what's intended by the comments. And I think we can move forward in really accepting those comments to improve the document in terms of its clarity.

But we've always -- just to be clear, we've always intended that whether we request information and then have licensees do an evaluation and send us the information or whether we request action, we always intended the same endpoint. And that same endpoint was that licensees do this evaluation to decide what are the points along on an implementing basis.

MR. CULLISON: Now going into the requested information that's listed in the Generic Letter. Similar to the draft Generic Letter issued for public comment, the staff is considering requesting two sets of information. The first is -- which is due within 60 days of the date of the safety evaluation providing the guidance for performing the

requested evaluation -- addresses are requested to provide information regarding their planned actions and schedule to complete the requested evaluation.

The provided information should include the following:

A description of the methodology used or that will be used to analyze the susceptibility of the ECCS and CSS recirculation functions to adverse effects opposed to accent debris blockage in operation with debris-laden fluids identified in this Generic Letter.

Provide the completion date of this analysis that will be performed.

Provide a statement of whether or not you plan to perform a containment walkdown surveillance in support of the analysis identified in this Generic Letter and provide justification if no containment walkdown surveillance will be performed.

If a containment walkdown surveillance will be performed, state the planned methodology to be used and the plan completion date.

And from the draft Generic Letter, we changed the due date on this to reflect the fact that the methodology will be released -- issued after the Generic Letter. So as not to take time away from the

addressees to respond, we set the due date for this for a period after the issuance of the methodology.

MEMBER FORD: Let me be clear about the timing here. Assume that the Generic Letter went out tomorrow, which it is not, but assume it did. Within 60 days, NEI, on behalf of the industry, have got to come back to you with a defined methodology?

MR. CULLISON: No, no. What it means is that -- so we issue today --

MEMBER FORD: Yes.

MR. CULLISON: -- actually there is no requirement based on the date of the Generic Letter issuance. What it is is that when we come out with the safety evaluation documenting --

MEMBER FORD: Oh.

MR. CULLISON: -- our approval of the methodology, that starts the 60-day clock.

CHAIRMAN WALLIS: And ACRS is somehow going to be involved, I believe, in the safety evaluation? Is that the case? In September?

MR. JOHNSON: Well, we're going to meet with the Subcommittee in August on the safety evaluation. We also have a meeting with the full committee in September.

MR. CULLISON: For the second information

request, the staff is considering changes to the schedule for responses from the draft Generic Letter as well as some changes to the actual information request.

So the specifics of the request are:

Addressees are requested to provide the following information by September 1, 2005.

Provide confirmation that the ECCS and CSS recirculation functions under debris-loading conditions are or will be in compliance with the regulatory requirements listed in the applicable regulatory requirements section of this Generic Letter.

This submittal should address the configuration of the plant that will exist once all modifications required for regulatory compliance have been made.

A general description of an implementation schedule for all corrective actions including any plant modifications that may be necessary to ensure compliance with the regulatory requirements listed in the applicable regulatory requirements section of this Generic Letter.

Provide justification for any corrective action that will not be completed by the end of the

first refueling outage starting after April 1, 2006.

The staff's expectations are that all corrective actions will be completed by December 2007.

CHAIRMAN WALLIS: What is the penalty if they're not?

MR. CULLISON: They have to come in and one, give us the justification if they're not going to complete them by the first outage after April 2006. And for our review and consideration of any future actions.

MR. SOLARIO: Dr. Wallis, Dave Solario. Obviously the licensees who don't complete by the end of 2007 will have to evaluate their justification for not being able to finish. And if it's not appropriate, then we'll have to take additional regulatory action. We're not defining it now, though, in the Generic Letter.

CHAIRMAN WALLIS: Well I guess I don't know what staff's expectation means in terms of enforcement.

MR. CULLISON: In terms of enforcement, what we are considering right now for the period of time before December 2007 is granting enforcement discretion while addressees are implementing their corrective actions. And which we're still considering

-- we have not run that by the Office of Enforcement yet.

But that's the plan for then. And after that period of time, it probably -- it will be on a plant-by-plant basis based on their justification they submit.

CHAIRMAN WALLIS: This isn't one of these things that appears and disappears from the draft letter is some statement about enforcement policy?

MR. CULLISON: Right.

CHAIRMAN WALLIS: And I'm not quite sure what is going to finally appear there.

MR. CULLISON: Because right now -- the reason that it appears and disappears is that we're having some internal discussions on the --

CHAIRMAN WALLIS: That's what concerns us about where you're going.

MR. CULLISON: Well, this is process. This is, to me, is primary process. Whether we have to use enforcement discretion or as what's being discussed right now is this analysis a boundary calculation for the ECCS model. And then covered by -- under the provisions in 50.46? Either way, we get the same end result. It's just how we get there.

And that's what's being -- why this --

we're saying considered --

CHAIRMAN WALLIS: Yes, it's a question in the letter you can be more direct and specific about some of these things or you can just leave it up to someone to sort of imply or assume or extrapolate how you're going to handle the enforcement issue.

MR. CULLISON: Well, we're going to -- when the final letter comes out, we'll be clear which path we'll take.

CHAIRMAN WALLIS: The letter seems to be getting more direct and clear every draft.

MR. JOHNSON: And, Dr. Wallis, let me just -- I thought I maybe heard in your question something along the lines of suppose the licensee chooses not to --

CHAIRMAN WALLIS: I was just wondering does this have any teeth. I mean does this have any -- it sounds as if this is going to have some real teeth. That everyone essentially is going to hustle to meet the regulations and there won't be a problem.

MR. JOHNSON: Yes, we are requesting that licensees complete their corrective actions by December 2007. If a licensee came back with a -- let's suppose a justification where they would need to go beyond 2007, we would consider it.

We are -- we believe with respect to regulatory space, that we would act -- that we would be -- could be -- would be prepared to order a licensee, should a licensee decide that they would not comply with the requested actions, as a compliance exception to the backfit rule, for example.

So we -- we feel that we're on firm regulatory space with respect to this issue. We, in terms of issuing the request, are providing the opportunity for licensees to come back with what they believe is a reasonable plan for implementation.

And by reasonable, again we think the time frame of 2007 should work for licensees -- for most licensees, unless they can provide the justification for why they should go beyond that.

CHAIRMAN WALLIS: I think my colleagues on the full committee who have plant experience may have some comments about schedule and feasibility and so on.

MR. JOHNSON: Before moving on, I also wanted to point out this is a change from the earlier draft letter, of course. The earlier Generic Letter said no later than April 1, 2005. And so we've bumped that out in recognition of the additional time that it would take -- could take for licensees to do the

evaluation, especially considering the fact that they're all trying to get these evaluations done at the same time.

MR. SOLARIO: Dr. Wallis, to add a little bit more to your last comment you made about your colleagues on the full committee. You've gotten copies of the public comments we got from NEI. NEI, in one of our last comments, pointed out how they felt that making slight adjustments to the interim milestones for the Generic Letter is what they would prefer for reasons of resources and expertise in the industry.

But their overall conclusion was is they still felt `07 was achievable. And NEI is speaking for the industry, I think.

CHAIRMAN WALLIS: That is reassuring. Thank you.

MR. CULLISON: And additional specific technical information requesting submittal is the minimum available NPSH margin for the ECCS and CSS pumps with an unblocked sump screen, the extent of the emergence of the sump screen at the time of the switch over to sump recirculation, and the submerged area of the sump screen at this time, the maximum amount postulated from debris accumulation on the submerged

sump screen, a description of the primary constituents of the debris bed that result in this head loss.

In addition, the debris generated by jet forces from the pipe rupture, debris created by the resulting containment environment, thermal and chemical, in the CSS washdown, should be considered in the analysis.

An example of this type of debris are despondent coatings in the form of gypsum particulates are chemical precipitants caused by chemical reactions in the pool.

The basis for completing the inadequate core containment cooling would not result due to debris blockage flow restrictions in the ECCS and CSS flow patterns downstream of the sump screen such as a HPCI throttle value, pump bearings and seals, fuel assembly in the debris screens --

CHAIRMAN WALLIS: Now there is no guidance on that yet?

MR. CULLISON: No. But as --

CHAIRMAN WALLIS: Is that something that they're capable of calculating?

MR. CULLISON: As we -- as you were told before, we expect that information -- it's ever-evolving -- to be available for the addressees by the

time they need to respond to us.

CHAIRMAN WALLIS: Wait a minute.

MR. ARCHITZEL: Actually, that was what I was discussing before. We do plan to have a set of values in the safety evaluation. And if we have an additional information from NEI at that time, we'll look at it. But we're working right now on more detailed guidance on that area, more acceptability than what's in that document right now.

MEMBER FORD: Could I ask something again on the expectations?

MR. ARCHITZEL: Right.

MEMBER FORD: You're saying by September the first of 2005, the submittals should have all this stuff?

MR. ARCHITZEL: Right.

MEMBER FORD: And we heard yesterday from Los Alamos a whole lot of questions, like the chemical effects that we've been talking about, a whole lot of questions about the zone of influence and a very long list.

You're expecting the industry to resolve the key -- those key uncertainties by September the first?

MR. ARCHITZEL: No, let me just address

one more time --

MEMBER FORD: I'm trying to come to the practicality.

MR. ARCHITZEL: Yes, the plan that we're on is we had a year and a half to get the ground rules down. We worked before they did it in trying to get them acceptable. So some of the items they're still on the table with, are supposed to be worked on in the ground rule stage.

We did get a document in October of last year. We reviewed that document. We had comments. They incorporate. That's that 100-page RAI document where they've addressed quite a few of our comments.

And at this stage, we're at the point of we'll say filling in the holes. Or the idea is that we have what NEI has right now. We're going to go forward. If we like what they have, we're going to accept it. If not, we're going to propose the alternate.

And we're in the process of developing some of those alternates. In selected cases, the baseline is fairly conservative. It may be very easy to accept as the baseline. The rest will be what we're doing. But we will have some discussions that we'll handle.

But it's not really any more necessary that NEI or issues has got to come back to us. We're not planning for that.

MEMBER FORD: But I'm getting the impression that if we're taking the baseline case, NEI baseline case, many plants will fail. And, therefore, in order to keep the plants going, you're going to have to rely on the refinements. Where are all these question marks.

MR. JOHNSON: Let me try also --

MEMBER FORD: Am I missing a point here?

MR. JOHNSON: Well, not necessarily. But let me just try and say that recall that all of these questions that we're talking about and, in fact, we've talked about maybe coming back later on today and talking about what the key issues are that Bruce and Angie pointed out yesterday where there may be differences between the baseline and the refinement, what's proposed by the industry, and where we may be coming out.

All of that has to be done, resolved, and ready for issuance in this SE that's going to go out in September of this year, okay? And so then licensees have a year to use that approved methodology. And then they're coming back with the

results based on that approved methodology.

But we will have resolved by this September those issues that you heard discussed yesterday.

MEMBER FORD: Whoa, okay.

MR. HANNON: This is John Hannon, Plant Systems Branch. I heard yesterday, too, that you folks are struggling to see how you might add value in this process. And I think what we want to try to achieve, at least by the end of the day, is to provide for your consideration those top key issues where we would look to get your advice on an informal basis to enable us to have that resolution completed by September.

MEMBER KRESS: What role does the parallel risk informed approach play in all this? Is it just a confirmatory thing or --

MR. ARCHITZEL: Oh, we have a session on that a little later. What it does is if it's an option that's taken, it significantly reduces the break size that has to be considered under certain rules. And whether it's risk -- we do have a presentation coming up -- whether it's risk-informed or realistically conservative, it has an effect of dropping significantly that large break.

Now you still have the issues with combinations --

MEMBER KRESS: So does the Generic Letter allow for this alternative approach --

MR. ARCHITZEL: Yes.

MEMBER KRESS: -- in the wording somewhere?

MR. ARCHITZEL: Yes. This is -- I think John said this is -- there's a Chapter 6 in the NEI guideline that is this alternate --

MEMBER KRESS: So that would be part of the approved methodology?

MR. ARCHITZEL: -- option -- so part of the approved methodology.

MEMBER KRESS: Oh, okay. I see.

CHAIRMAN WALLIS: This is a very interesting experience for me. I mean usually we ask the staff why they're taking so long to do -- and this time we seem to be asking you whether you can possibly do it as quickly as you say. Okay.

MR. CULLISON: And verification that close tolerance subcomponents, and pumps, valves, and other ECCS and CSS components that are not susceptible to plug in or excessive wear due to extended post-accident operation with debris-laden fluid are the

basis for concluding that water inventory would not be held up or diverted by debris blockage at choke points in the containment recirculation sump return flow paths.

And if an active approach is selected in lieu of or in addition to a passive approach, the mitigating effects of the debris blockage, describe the approach and the associated analysis.

Other requested information includes a general description of and plant schedule for any changes to the plant licensing basis resulting from any analysis or plant modification done to ensure compliance with the regulatory requirements listed in the Generic Letter.

Any licensing actions needed to support changes to the plant licensing basis should be included with the submittal.

A description of the existing or planned programmatic controls that will ensure that potential sources of debris introduced into containment will be assessed for potential adverse effects to the ECCS and CSS recirculation functions.

Addressees may reference their response to Generic Letter 98-04 to the extent that their responses address these specific form material control

issues.

The fact that the staff is considering changing the Generic Letter, request the compliance exceptions to the backfit rule. Proposed Generic Letter issued for public comment was not a backfit.

To support the compliance backfit determination, a simplified backfit analysis is currently being performed.

Finally, the Generic Letter requires response per 10 CFR 50.54(f) for the purpose of verifying compliance with these existing applicable regulatory requirements.

And that concludes my presentation.

CHAIRMAN WALLIS: What is the role of the simplified backfit analysis?

MR. CULLISON: Well, it serves two purposes. One, we have to do one when we -- with the compliance exception to the backfit rule. Internal procedures require that you do a simplified backfit evaluation. Ours is currently being performed.

CHAIRMAN WALLIS: And what's the output of this analysis?

MR. CULLISON: It's a simplified cost benefit analysis.

CHAIRMAN WALLIS: Suppose it turns out the

costs are not worth the benefit?

MR. CULLISON: This is a compliance exception. We don't have to take cost benefit into account.

CHAIRMAN WALLIS: Then why do you do it?

MR. FERNANDEZ: Antonio Fernandez from the Office of General Counsel. The staff in the past has committed to doing a backfit analysis when it has changed its position.

In this case, we've taken the position that the Generic Letter is a 50.54(f) request for information. Therefore, it's not encroaching any of the requirements of the licensees. Therefore, it cannot be a backfit because a backfit can only accrue when you're encroaching new requirements on the licensees.

As a matter of course and practice, the staff has in the past performed this analysis although it's not required by the regulations.

CHAIRMAN WALLIS: Are you going to publish the results of this backfit analysis?

MR. JOHNSON: Yes.

MR. CULLISON: Yes.

MR. ARCHITZEL: One thing I would like to point out. It's not a full-blown regulatory analysis.

It is a backfit so it is simplified. It doesn't have to meet all the criteria if you did a real backfit. So there are some differences in the analysis you will have.

This issue did have a backfit analysis, a regulatory analysis in `85. And that was the basis for not going forward at that time.

CHAIRMAN WALLIS: It is pretty easy to evaluate the costs. But how do you evaluate the benefit? So -- for compliance with the rule?

MR. THOMAS: Let me -- it's a reg analysis so basically --

CHAIRMAN WALLIS: Could you identify yourself?

MR. THOMAS: Brian Thomas, NRR. Basically with any regulatory action, we do a reg analysis. And basically what you're looking for is the data point, the data point of costs and benefits that is either being imposed on, you know, for the requirements that are being imposed on licensees.

That gives us a sense of what, you know, what is the impact of the action. And basically in this case, it's, as Ralph said, it's a simplified analysis. But it still gives us a data point for reference.

CHAIRMAN WALLIS: Well, you are going to change the probability of core damage by 1,000 ten to the minus blah, 1,000 ten to the plus blah. And do you have a number to put on that as a cost and expend benefit?

MR. ARCHITZEL: Actually, there has been a cost benefit analysis already performed. It's required as part of the GSI process.

It was performed at the technical assessment stage by the Office of Research. It showed a net benefit of -- and this is core damage frequency-based and things like that, it was net benefit of like 60 million versus 40 million for the cost. So it was net beneficial at that time.

We're doing an update now.

CHAIRMAN WALLIS: So the safety benefit is 60 million?

MR. ARCHITZEL: I'm trying to -- I don't know the numbers.

CHAIRMAN WALLIS: There was a number you put on it?

MR. ARCHITZEL: It was positive at that time, at the time that -- maybe Mike Marshall remembers specifically the numbers. But it was positive.

This was a two-year old one. We're updating that analysis now, putting in new information. But even if it didn't come out net positive, we'd still go forward because it's a compliance exception to the backfit rule.

CHAIRMAN WALLIS: I just wondered. I think personally I feel it would be very good if you could put economic measures on some of the safety benefits.

MR. ARCHITZEL: It still may not come out positive.

CHAIRMAN WALLIS: It doesn't seem to be the way the agency usually operates. Wonderful that everything on an economic basis you could do a cost benefit analysis on everything. But I don't think that's the way the regulations are structured.

They're deterministic. Thou shalt do this, this, and this without any idea of what the benefit is.

MR. ARCHITZEL: I think these are the backfit rule required analysis if you're in a real backfit --

CHAIRMAN WALLIS: Yes, okay. Well, it's good to see it.

MR. THOMAS: But again, this is one of

those things that we're in the process of doing, we are currently undertaking at this particular time to get the analysis done. But we don't have any results just yet.

MR. CULLISON: Any further questions?

CHAIRMAN WALLIS: Well, when the full committee meets on this in -- when -- a couple of weeks?

PARTICIPANT: Two weeks.

CHAIRMAN WALLIS: Two weeks? Are we going to have a Generic Letter which has been endorsed by senior management by then? Because we don't particularly like a situation where we endorse something and find that what actually happens is different.

MR. JOHNSON: Let me -- Mike Johnson -- let me commit to give you -- we will go as far as we can with getting you the best, most final Generic Letter.

CHAIRMAN WALLIS: Can we have the senior management person at our meeting?

MR. JOHNSON: I think I've read somewhere in the ECRS's structure that if the staff doesn't know the answer to the question, we should say --

CHAIRMAN WALLIS: Well, can -- I said can.

Obviously you can. But it would be nice if we could.

MR. JOHNSON: I understand.

CHAIRMAN WALLIS: I think it would be very appropriate that the responsible persons, are ultimately responsible with whom -- well, perhaps not the Commission but someone who is really responsible for the thing to be there so we can ask the key questions. Maybe not there all the time but there for a period.

Anything from my colleagues?

MEMBER FORD: I'm just overwhelmed by the number of questions that we have brought up in for instance, the September last year memo, plus the questions I'm hearing from Los Alamos.

And somehow or another, this is all going to be resolved within just over one year. I find that --

CHAIRMAN WALLIS: Six weeks.

MEMBER FORD: Well, the SE is going to come out roughly within six weeks. But they're saying September 2005, they're going to have the submittals in from the various plants and plant-specific dealings like this, I find it rather surprising to put it mildly.

CHAIRMAN WALLIS: But maybe if it were

achieved, it would be something to point to as a success.

MEMBER FORD: Yes, but if not -- yes.

And then -- but if my gut feeling is correct, then what's the risk associated with --

CHAIRMAN WALLIS: Oh, that's an interesting question.

MEMBER FORD: -- not having done these things to an adequate technical degree? I mean I don't know the answer to that.

MEMBER KRESS: Do you want any comments?

CHAIRMAN WALLIS: Well, we're ahead of schedule, I think, aren't we?

MEMBER KRESS: Well, you know, if I take the simple Kress view of things, the rule requires adequate long-term cooling. And the current licensing basis has been put into question as to whether it does this or not.

The staff, I think, has to do something. And it doesn't matter whose fault it is that the rule is not being complied with. So the issue of whether it's a compliance backfit or not, I think is right.

And the Generic Letter is asking the plants to determine whether or not they're in compliance. And to use methodology that's not quite

yet approved but looks pretty good to the staff, and it's got some missing parts. But they expect to get those finished in time for them to use this methodology by the time frame they're asking for.

That's the shaky part for me right there. I would prefer to see them wait just a little while on this Generic Letter until that methodology really gets going over and approved. So as far as everything they're doing, that's the one area which is a question mark for me.

With respect to what the risk is, I'm not even sure that's a valid question. This is a compliance issue. One of the key functions of reactor safety is you provide for long-term cooling. It's a defense in depth or whatever you want to call it. It's a key function. It needs to be complied with.

Now I would like to know what the risk is, too. But no matter what it turns out to be, I think they have to do what they're doing.

So my view is that they're on the right track but I would wait a while before I issued this Generic Letter so that -- until I got the full NEI methodology looked at and approved. That's the only real comment I would add.

MEMBER FORD: If I could respond. I was

talking about risk, not in the narrow sense of CDF. I was talking about risk in terms of public perception of those rules.

MEMBER KRESS: Oh, yes, I agree with you there. And some of the public perception, I think, is quite bad on this issue because it's been around so long and there's been these incidents. And people want to know what the heck NRC is doing about it. And so, you know, I think there are perception issues.

CHAIRMAN WALLIS: I thought you were referring to risk in terms of making decisions in the presence of uncertainty and then being surprised by some research result which you haven't yet got which suddenly said gee whiz, there's something which we --

MEMBER FORD: I forgot this.

CHAIRMAN WALLIS: -- yes, didn't consider.

MEMBER FORD: That's part of the broad definitions.

CHAIRMAN WALLIS: There was the risk of making a decision then being surprised afterwards by new information.

MEMBER RANSOM: I would like to reinforce a part of Dr. Kress's comments that I don't believe from what I've heard this zone of influence idea, this rather simplistic model, the only way it's going to be

good enough, I guess, is if what's chosen happens to be sufficiently conservative. You know, that uncovers it.

But to me it doesn't look mechanistic enough. And the work that might be required to really quantify that, I don't see that being able to be done in the length of time.

And that -- if you're off by a factor of two for example, and you design some screens and this would apply equally well to the Framatone work, you'd be out in left field.

MR. ARCHITZEL: Dr. Ransom? Ralph Architzel of staff, can I make a quick comment on that? I know I heard it yesterday and maybe I should have said something about it yesterday.

But if you're comment goes to the spherical approach and translation of that volume into an equivalent volume sphere, I guess I'd like to say or ask the committee to consider that this was an approach and an issue -- I know we sent you a November letter -- that was applied to the PWR.

It's a simplifying approach because of the reflections. And it's too difficult to take that jet and look at all the possible angles, all the possible break points. It was too difficult a problem.

The compromised position was to take the equivalent volume, do the reflections, and maintain that volume for an analysis of this problem. And I just ask the committee to consider there was a prior approval that there is a precedent for accepting that approach. And that is one area that we considered that we didn't really need to revisit for this resolution.

So that would be difficult if we now have to develop a new methodology for assessing these breaks.

CHAIRMAN WALLIS: If there was --

MEMBER RANSOM: Well, I could be alone in understanding.

CHAIRMAN WALLIS: -- some fundamental error in it?

MR. ARCHITZEL: Pardon?

CHAIRMAN WALLIS: If there was some fundamental error in it --

MR. ARCHITZEL: Obviously, it is a judgment call. But if the equivalent volume is the area where you're looking at, that's one thing. But the approach about taking that volume and mapping it to a sphere, that's been an accepted practice that's been applied.

And it's sort of fundamental to sump --

CHAIRMAN WALLIS: But how big that sphere should be is something --

MEMBER RANSOM: That's the question.

MR. ARCHITZEL: Oh, but that's a different question, okay.

CHAIRMAN WALLIS: How the big that sphere should be is something --

MR. ARCHITZEL: I was only commenting on the translation to spherical. Not on the --

MEMBER FORD: No, I think -- I don't have a problem with that but the method for choosing the diameter of the sphere I think is what I would call into question.

MR. ARCHITZEL: The equivalent volume that we were taking?

MEMBER FORD: Right.

MR. ARCHITZEL: That is one of the fundamental tenants we've had.

MEMBER FORD: I don't know about the rest of the committee but I'd certainly be interested in hearing a little more about the technical basis for it.

CHAIRMAN WALLIS: When we raised the question, we had about a page on it in our last

letter.

MEMBER FORD: If I can do some simple things that would lead me to believe it might be quite different. And the only thing that will save you if the maximum volume you chose is big enough.

CHAIRMAN WALLIS: Whole containment.

MEMBER FORD: Yes, I mean it could be that.

CHAIRMAN WALLIS: But I understand sometimes more is better.

MEMBER FORD: Well, for example, the damage mechanism I don't think has ever been looked at either. Clearly the fans in the containment don't cause damage to the insulation. Those are low velocities.

So you might ask where is the threshold where damage starts to occur. And clearly there is a situation where you release this jet. It's high enough to cause great damage. And it decays in time down to this threshold.

It's also a progressive-type thing. If you're exposed to the jet, yes, you're going to tear it up. And so how long does this go on? What is the extent?

CHAIRMAN WALLIS: You know but the time

doesn't appear in this zone of influence at all.

MEMBER FORD: All right. And so I think that needs more looking at.

CHAIRMAN WALLIS: Yes, it would seem that if you subject insulation to battering for one second, it's different for 20 seconds. There are all sorts of questions you can raise like this. Which is why, I think, we suggested in our letter that maybe it's just too much of a morass. You should look for a risk-informing or some other assurance of long-term cooling.

MR. ARCHITZEL: And we are proceeding down that path. I guess the point I was making is I'm trying to convince you that this is an issue that we've already addressed. And it was a very difficult issue. It went through the BWR approval process. And the ACRS was involved.

CHAIRMAN WALLIS: This committee doesn't really attempt to believe that just because there's a history of accepting something, it's technically valid.

MR. ARCHITZEL: It is a difficult problem. And we do have the risk-informed piece that we're working on.

CHAIRMAN WALLIS: Well, thank you.

MR. JOHNSON: Can I make one other point? This is in regard to scheduling. And I understand the concerns about schedule. And, in fact, the concerns about whether licensees can, in fact, do the evaluation by September of 2005.

And, I mean, we're comforted by what we got in public comments where the industry didn't, in fact, question whether they could sort of meet that milestone and meet the -- having fixes in place by the 2007 milestone.

I would just remind you that there's another perspective, another stakeholder that would say, you know to the public it would say, you know, we should have resolved this issue yesterday after the 2.206 petition and so that's what we're balancing as a staff, is trying to -- is recognizing that every day that we delay beyond September 2005 in getting in house the staff's evaluation -- an evaluation -- a response to the evaluation of what the licensees are planning to do are delays in weeks or months in terms of when the final fix is going to be in place.

And we are anxious to get those fixes in place.

MEMBER FORD: Yes, but associated with that fact you've mentioned, surely right now there

must be some sort of priority judgment and prioritization as to which of these uncertainties that we've come up with and which LANL have come up with are the prime ones.

And those are the ones that get hit first. Those are sorted out well in time so the industry can implement these by September 1st. I haven't heard anybody come up with that judgment in prioritization questions. And maybe that will come up later in the session.

MR. JOHNSON: We're going to try to talk some more about that in terms of what John was alluding to --

MEMBER FORD: Okay, good.

MR. JOHNSON: -- in response to the points that you made.

CHAIRMAN WALLIS: Well, we've now reached the time when we planned to move on. Do you have anything more to say? Or can we move on?

MR. CULLISON: Thank you for your time and attention.

CHAIRMAN WALLIS: Thank you very much indeed. That was a very interesting session.

Well, let's move on.

MR. WHITNEY: Thank you. I'm Leon Whitney

from the Plant Systems Branch.

I want to talk about the Bulletin 2003-01 Status. And I want to thank you for letting me use part of your table. I have a medical problem preventing me from standing. And I have a new medical problem that I'm freezing to death in here. Let's see if I can keep my jaw moving.

Next page. The Bulletin 2003-01 was titled Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors. It was issued June 9, 2003 with a 60-day 50.54(f) response time.

The conclusion of my presentation is that Bulletin 2003-01 is planned to be closed out by December 2004. And based on the previous discussion, I'm prepared for discussions whether that's achievable or not. But we'll see how that goes.

Next page. Bulletin 2003-01 Purposes --

To inform licensees of results of NRC-sponsored research into PWR susceptibility to recirculation sump blockage in the vent of a high-energy line break;

To inform licensees of results of the potential for additional adverse effects from sump blockage and debris deposition during ECCS and

containment spray operation;

Request licensees to either confirm compliance on 10 CFR 50.46(b)(5), that's the Bulletin 2003-01 Option 1 or describe any compensatory measures implemented to reduce potential risk due to post-accident debris blockage. That's the Bulletin Response Option 2.

Next. The bulletin listed six possible interim compensatory measures, ICMs. Operator training on indications of and responses to some clogging, ICM No. 1.

Procedural modifications, if appropriate, that would delay the switch over to containment sump recirculation, ICM No. 2.

Ensuring that alternative water sources are available to refill the RWST or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere, ICM No. 3.

Next page. More aggressive containment, cleaning, and increased foreign material control, ICM No. 4.

Ensuring containment drainage paths are unblocked, ICM No. 5.

And ensuring sump screens are free of adverse gaps and breaches, ICM No. 6.

The licensees for all 69 PWRs responded within 60 days.

Next page. Yes?

CHAIRMAN WALLIS: Are you going to tell us if any of them confirmed compliance?

MR. WHITNEY: Yes, that's coming up here, the next words.

CHAIRMAN WALLIS: Well, I guess you told us yesterday, right?

MR. WHITNEY: Davis-Besse.

CHAIRMAN WALLIS: Right. Only one.

MR. WHITNEY: Only one. But they had a head start. They had been working on the issue based on their downtime and they had gotten to the issue.

General licensee response characterizations. The licensee for Davis-Besse chose Option 1. All other licensees chose Option 2.

All licensees reviewed so far committed to aggressive containment, cleaning, and foreign materials control, ensuring containment drainage paths are unblocked, and ensuring sump screens are free of adverse gaps and breeches, ICMs 4, 5, and 6.

Next slide. Combustion Engineering and Westinghouse licensees reviewed so far stated that they would consider the recommendations contained in

the Westinghouse Owner's Group's evaluation of potential ERG and EPG guidelines. There seems to be a typo on that page.

And I'm going to discuss the B&W plants also very shortly.

As long as we're on the subject of the Westinghouse actions, let's list the 11 candidate operator actions that they created out of the lead in from the bulletin.

The 11 candidate operator actions in WCAP 16204 Rev. 1R, secure both spray pumps;

MEMBER FORD: Which means switch them off, right?

MR. WHITNEY: Right, secure means stop.

Manually establish recirculation before RAS, recirculation alignment signal;

Stop one train of HPSI/high head injection after RAS;

Early stop of one HPSI/RHR pump prior to RAS;

RWST refill greater than one RWST volume via refill or RWST bypass;

Aggressive cool down on depressurization after small break LOCA;

Provide guidance on symptoms and

identification of sump blockage;

Develop contingency actions for sump blockage, loss of suction, and pump cavitation;

Stop one train of HPSI/high head injection before RAS and prevent and/or delay CSS, that's contaminant spray, for small break LOCA at ice condenser-designed plants.

CHAIRMAN WALLIS: Now --

MR. WHITNEY: The document -- I'm sorry.

CHAIRMAN WALLIS: -- do all of these effect the success criteria in some way? I mean if you turn off pumps or you stop a train and so on, you're changing the normal sequence of an event.

MR. WHITNEY: Yes, let me give you the characterizations that -- a couple of these were actually not recommended by Westinghouse when all was said and done. Is that part of the thrust of your question?

I can characterize each of these as to what the Westinghouse -- in short summary what the Westinghouse Owner's Group said about them if you wish.

No. 1 -- and again, beyond this, it was a thousand pages of document. I don't have much more details than this but I tried to summarize what they

said -- securing both spray pumps. It's okay only where containment fan coolers can handle 100 percent decay heat and certain iodine and pH conditions pertain.

No. 2, manually establish recirculation before RAS, okay at some plants with conditions. I didn't go into all the detail of that.

No. 3, which happened to be handled for CE plants and Westinghouse plants separately. There was a 3A and a 3B, but generally stop one train of HPSI/high head injection after RAS. They said that was okay on a plant-specific basis.

No. 4, early stop of one HPSI/RHR pump prior to RAS. Their consideration was this may not be risk beneficial.

No. 5, the RWST refill -- generally recommended after RAS.

No. 6, greater than one RWST volume via refill or RWST bypass. In beyond design basis situations, such as loss of recirculation due to sump blockage, that's the only time they recommend that.

No. 7, aggressive cool down depressurization after small break LOCA. The action is to simply refine the current EPG terminology for clarity to positively achieve this. In other words,

give positive direction on directions that are already there in the EPGs.

CHAIRMAN WALLIS: This aggressive cool down sounds like turn this small break into a big one.

MR. WHITNEY: Well, you try and get to RHR and stay out of recirc. It would be a small break LOCA.

No. 8, provide guidance -- and this is another one where there were -- CE and Westinghouse handled separately -- 8A and 8B -- provide guidance on symptoms and identification of sump blockage. They okayed that on a plant-specific basis.

CHAIRMAN WALLIS: Is there some sort of sump blockage meter? I'm sorry, your red light is on.

MR. WHITNEY: The red light means? That's the ten minutes now?

CHAIRMAN WALLIS: Yes. There's a delta P across the --

MR. WHITNEY: I'm sorry.

CHAIRMAN WALLIS: There's a delta P across the screens or something. The direct measurement of sump blockage?

MR. WHITNEY: I'd have to reread this one again.

PARTICIPATION: Pump cavitation.

MR. WHITNEY: Does the cycling of the amperage of the pump -- I mean --

CHAIRMAN WALLIS: So that's an indirect measurement?

MR. WHITNEY: It's a judgment call.

CHAIRMAN WALLIS: An indirect --

MR. WHITNEY: There's no one in there and no way to --

CHAIRMAN WALLIS: There's no delta P measurement on this screen?

MR. WHITNEY: Not on the screen, no. It's deduced from the pump characteristics.

No. 9, again one -- 9A and 9B for CE and Westinghouse. Develop contingency actions for sump blockage, loss of suction, and pump cavitation. Okay on a plant-specific basis.

No. 10, stop one train of HPSI/high head injection before RAS. The WOG decided that this was not risk beneficial for anyone.

No. 11, prevent delay core spray for small break LOCA at ice condenser-designed plants. No for a generic EPG change but for certain plants, it would be okay on a plant-specific basis.

MEMBER KRESS: Now what were these contingency actions?

MR. WHITNEY: Again, I don't have all the detail. I actually could take an hour to sit down and give you a lot of detail. But I could only summarize the ones.

Next slide. In general, there are three sets of Westinghouse and Combustion Engineering licensee responses to Bulletin 2003-01. One set of licensees responded with planned actions following directly along the lines of the bulletin and its interim compensatory measures.

Another set of licensees, while committing to certain ERG and EPG enhancements such as RWST refill, ICM No. 3, responded that they considered current procedures to be adequate and that any major changes would be in conflict with the current framework and/or philosophy of its vendor-approved EPGs and ERGs.

Now I'll note that all licensees were committing to look at the Westinghouse when they came out.

A third set of licensees, other than committing to certain plant-specific actions, things not directly discussed in the bulletin, stated that they planned to defer implementing ICMs 1 and 3 until the Westinghouse Owner's Group addressed the

compensatory measures related to revision of the EPGs and ERGs.

This third set of licensees justified their blanket deferrals of ICMs 1 through 3 with a number of rationales. One, the adequacy of existing procedures; two, the possible actions could result in conditions that would be outside the design-basis safety analysis assumptions. That is, for example, single failure, and could create conditions which would make recovery more challenging.

CHAIRMAN WALLIS: Now that concerned me is that in trying to solve this problem --

MR. WHITNEY: Right.

CHAIRMAN WALLIS: -- you might actually create other ones.

MR. WHITNEY: Yes.

Possible actions would be inconsistent with the overall WOG EPG symptom-based philosophy, that is that contingency actions are taken in response to emergent symptoms.

Five, possible actions would be inconsistent with the currently trained operator responses using the WOG EPGs. The mixing of apples and oranges in the operators' minds and the way they approach things.

And six -- or, excuse me, that was four and five is to be effective in delaying the switch over to containment sump recirculation, operator actions to stop ECCS or CSS pumps must be taken in the first few minutes of an event, which is clearly the wrong time to be taking these kinds of actions when you're busy with the automated stuff.

Next page. B&W licensees responded in various ways. Davis-Besse made major sump modifications and replaced the HPSI pumps with those less susceptible to debris damage.

Crystal River already had sump backflush capability installed.

Oconee installed orifices in the low pressure injection and building spray lines to optimize RWST outflow rates and increase net positive suction head margins. And again, I'm just giving highlights of what they used.

ANO-1 and TMI-1 received five and four RAIs respectively, including requests to respond regarding plans for WOG or equivalent actions.

Staff consideration of 60-day responses. The staff continues to issue requests for additional information asking Westinghouse and Combustion Engineering licensees to discuss their plans to

consider implementing the WOG operational guidance, which is the candidate operator actions we've already discussed with technical justifications for WOG-recommended compensatory measures not being implemented.

And, for that matter, we'd like to see the technical justifications for the ones that are because most of them are judgment calls on a plant-specific basis.

And to provide certain design, training, and scheduling details regarding any interim compensatory measures being implemented.

Next page. The staff is beginning to receive supplemental responses to Bulletin 2003-01, which lay out licensee plan with respect to WOG-compensatory measure recommendations.

Upon receipt of adequate supplemental responses from PWR licensees, and that does not mean completing these actions, it means giving us the plans and schedules for the ones -- and justifications for the ones they select, and appropriate verification activities, the bulletin will be closed out for those licensees.

The staff goal for our bulletin closeout effort is December 1, 2004.

CHAIRMAN WALLIS: So what has been the safety effect of this thing? Was there some sort of measure of improved safety that's been achieved by these actions?

MR. WHITNEY: I don't think we've assessed it in those terms. We have looked at the WOG since it came out in March, which we expect most plants to be implementing on a plant-specific basis.

And on initial review, we find that those seem satisfactory to cover the waterfront of the bulletin and, of course, the analysis, when you look at it, from Westinghouse, is very complete, very well written, and seems to address the safety and risk issues.

So the licensees haven't completed that effort. But we believe that on initial review, the Westinghouse information appears satisfactory.

MR. JOHNSON: One of the -- this is Mike Johnson, one of the things that we talked about in the bulletin was we suggested a list of compensatory actions that licensees should consider. And one of the things that we were wanting to have happen at that time was for the initiator to consider additional things. And this is the result of that, thinking about additional things beyond what we had even

proposed in the bulletin.

We talked about, I think, there was a --

MR. WHITNEY: Could we go back to the Westinghouse?

MR. JOHNSON: -- some work that talked about risk benefit based on user compensatory actions. So we have greater assurance based on these other things should licensees implement them.

But Leon's correct. We haven't gone back to try to actually quantify.

CHAIRMAN WALLIS: What I'm looking for is not in the LANL report, in the -- what was it called -- the report that got things going, the parametric one. I think there was an assessment of the increased CDF was the result of some blockage, which was quite high.

And I think we quoted -- may have even quoted it in our letter. And then there was some subsequent report which looked at compensatory measures and all these things you could do, which made that number much smaller. And that's what I'm looking for is sort of a measure of success of these kinds of measures in reducing the apparent problem.

MR. ARCHITZEL: Ralph Architzel from staff, one thing I will say on the Los Alamos Report

is it was based, the operator recovery actions part of it was based on what was in the EPGs. So that if a plant wouldn't do it, you know, for it to occur in EPGs, they wouldn't credit it. And there was -- I forget -- some actions that will be taken with direct revisions that weren't considered.

So now if they would go back -- but nobody's gone back -- and look at some of these and try to quantify it, there may be a capability to do it, but they want to point out it wasn't -- that operator recovery was based on existing procedures and guidelines. And it wasn't based on additional things you might do.

So there could be some additional reduction if we went and looked at it for quantification. But we didn't do it for quantification additionally after this bulletin.

MR. JOHNSON: But your recollection is correct. We cited that Los Alamos study in terms of talking about the potential increase or the potential benefit that could result from these compensatory actions.

And then we, in fact, went back -- and we don't have it. I guess Dave was looking to see if he could find a reference. But we did talk about it, trying to

quantify what risk benefit could be. And we just haven't gone back and looked to see where in retrospect.

CHAIRMAN WALLIS: That was fine. That was quite, I think, notable that not only did they -- Los Alamos parametric study say that quite a few plants might have troubles in meeting and complying. But it also pointed out that this had an effect on risk.

If it had a very, very tiny effect on risk, I think that the impact of the report would probably have been less. But when it came up with this apparent effect on risk, then some eyes were opened and said, gee whiz, not only is this a compliance, but it seems to be risk significant.

MR. WHITNEY: I can tell you that the Westinghouse has a section on risk for everyone of these candidate operator actions. And that's how they ended up with their judgment against two of these.

MR. SOLARIO: Dr. Wallis, this is Dave Solario from the staff. I have a copy of the response to the petition received from the ECS. I'm not sure about what version of it is out there in the public realm so I'm going to need to get back to you on this.

We do talk about there being a risk associated with doing parametric studies. And we also

talk about the fact that the actions that we outlined in the bulletin were targeted at trying to reduce that risk. And providing the basis for continued operation.

So as you heard from Leon, the number of licensees that did 4, 5, and 6 -- all licensees did 4, 5, and 6. Some actually did 1, 2, and 3. Maybe a few did something or there was already something there.

Others are studying it and trying to take the appropriate action consistent with recommendations from their vendors. And I'll commit to get back to you on the details of what we're going to be writing in this so that we can give you a better picture of things.

CHAIRMAN WALLIS: I think this is a question that this committee has had all along is that here's all this process set in motion and here is this Generic Letter which appears to be taking a sort of tough compliance line.

What's the real effect of all this stuff on reactor safety? Is there some kind of measure? Is it worth doing? And what's the payoff? And so on. That kind of big picture would be very good if at some time someone could present it very clearly so that we could be sort of convinced that what we're doing is

making a contribution to safety and isn't just going through some -- being tied up in a regulatory sort of cul de sac where you have to go there anyway but it doesn't matter, you know?

MR. WHITNEY: Having read the Westinghouse document, and believe me a thousand pages, they did a direction risk in each one so we have an indicator at least that there is a cost benefit to a number of these.

CHAIRMAN WALLIS: That's nice to know.

MR. HARRISON: This is Donny Harrison from the staff also. And some of the reactions that the WOG addressed were also addressed in the Los Alamos study, the recovery follow on study like redoing on the RWST.

So there's a -- you can almost compare kind of the simplistic assumptions that were done a couple of years ago versus what the WOG is now saying. You can kind of see what the different perspectives are.

MR. WHITNEY: I've got to tell you, I'm from Fire Protection. That's my specialty. And I was not too enamored with any NEI help at times. I thought NEI and Westinghouse added a lot of value in this document, I must tell you.

MR. HANNON: This is John Hannon, Plant System Branch. I would just point out, too, that -- I heard the concern about unintended consequences expressed. And one thing we have to remember is that the licensees when they were to adopt some of these issues, they had to go back and look at their design basis.

I am aware of at least one plant that has come in with a license amendment that would need to be reviewed by the NRC and approved to allow them to implement one of the changes that we're suggesting.

CHAIRMAN WALLIS: Well, along the lines that -- the remark you just made, it does appear that in facing this issue, there was sort of a collaboration between the regulatory agency and industry to solve the problem, which appears to be much more effective than a confrontational-type of approach.

MR. WHITNEY: Oh, absolutely.

CHAIRMAN WALLIS: Although some of the replies were -- the legalistic ones -- one might way more to the defensive and so on but at the technical level, there seems to have been very useful cooperation.

MR. WHITNEY: When licensees make the

statement possible actions could result in conditions that would be outside design-basis safety analysis assumptions such as single failure, we're looking at licensing actions in order for them to -- if they look at the Westinghouse document, decide it's applicable, they would end up in licensing space.

CHAIRMAN WALLIS: Did we allow too much time for this?

MR. WHITNEY: I guess you did.

CHAIRMAN WALLIS: Either that or you did a fantastic job of getting through it in half the time.

MEMBER KRESS: In ten minutes.

CHAIRMAN WALLIS: We didn't pay much attention to that.

MEMBER KRESS: No, you didn't.

MR. WHITNEY: I had three interruptions during the ten minutes, so --

(Laughter.)

MEMBER KRESS: We get three demerits.

CHAIRMAN WALLIS: Well, we are not allowed to get ahead of schedule, is that true.

MR. CARUSO: Well, why don't we take a break here.

CHAIRMAN WALLIS: We're still with NRR

until lunch, is that right?

MR. CARUSO: Right.

CHAIRMAN WALLIS: Well, maybe the risk-informed approach will take longer than we expected.

MR. ARCHITZEL: I don't think it will.

CHAIRMAN WALLIS: You don't think it will?

PARTICIPANT: It depends on how many questions you have.

PARTICIPANT: Well, you've already had a presentation on that yesterday by NEI. And there are differences --

CHAIRMAN WALLIS: Right.

PARTICIPANT: --but I don't think it will take a full hour.

CHAIRMAN WALLIS: Well, there's Michael Johnson. He's got closing remarks. Want to make some pre-closing remarks now? Or do you want to wait?

MR. JOHNSON: No, actually I don't.

CHAIRMAN WALLIS: You don't? Okay. So it looks as if we're going to be forced to take a break?

PARTICIPANT: I think so.

CHAIRMAN WALLIS: We're going to be forced to take a break until 10:45?

PARTICIPANT: How about 10:30?

CHAIRMAN WALLIS: 10:30? Something is

allowable by --

PARTICIPANT: Yes, I'll make a decision.

CHAIRMAN WALLIS: We've made a decision. Okay. We will take a break now then until 10:30. Thanks very much.

(Whereupon, the foregoing matter went off the record at 9:58 a.m. and went back on the record at 10:32 a.m.)

CHAIRMAN WALLIS: We are now back in session.

MR. ARCHITZEL: My name is Ralph Architzel. I'm going to be presenting along with Donnie Harrison from the PRA perspective the optional risk-informed approach for GSI-191 from the NRC perspective.

I would like to mention Mark Kowal's name. He is our lead engineer on this. He's not in this week but I'm covering for him for this presentation. For the conclusion, I would like to state that the staff is considering risk-informed resolution approach to be included as part of the NEI evaluation guidelines.

First, let me hit the milestones. The risk-informed initiative was invited in response to a letter by NEI about break sizes. We had several

public meetings, May 15th and just last week, June 17th, with NEI going on the methodology and what our views were and their views were. Had some phone calls as well before that.

There was today's briefing of the ACRS where we are presenting the current status of the methodology. We are anticipating a revised submittal of the guidelines by June 30th. This may be a little bit problematic for NEI but we are looking for them to expand what is currently in the Chapter 6 of that guide. It's very sketchy. It talks about templates and things like that and other aspects that we'll go over today, where you can take conservatisms. It has to be flushed out a little bit for us to do a review so we are looking for that to be submitted by June 30th.

We are in parallel preparing an information paper to the Commission which we anticipate completing by the end of July. The remainder of the items on this schedule is not unique to the risk-informed approach.

These are all the dates that go along with the SER and it is a part of the SER, the NEI guidelines, so when you get down to the August 17th briefing of the SER when we have to have a prepared

briefing, the full committee briefing, CRGR, and the final SER are all combined with the methodology review.

For the risk-informed approach, the NRC considers that we could consider risk-informed exemption process. Plant specific risk-informed exemptions would be submitted in accordance with 10 CFR 50.12. The exemptions are basically from 10 CFR 50.46. The original concept was along the lines if you didn't have a single failure-proof system where you weren't using safety grade equipment.

There has been some discussion with NEI, as you heard the other day, and currently we are still under evaluation. We have received the white paper but it may be that exemptions won't be required. It might be able to complete a realistic conservative analysis to implement this portion of the review for the break size above the debris generation break size.

And this is a very specific -- if I go back to the exemption process which we originally envisioned, this exemption would only apply for demonstrating the requirements of long-term cooling very specific to the debris generation aspect of it. Very limited exemption.

Donnie, you want to talk to the technical

basis?

MR. HARRISON: Sure. This is Donnie Harrison from the PRA Branch. I guess first to start we use terminology that we all agree with. When we talked risk informed, the staff always instantly thinks Reg Guide 1.174. If someone is using risk insights or they are using some qualitative arguments or they are using nominal values and the traditional deterministic branch accepts these nominal values in a calculation, that's not risk informed. It's taking some risk insights but it's not what we would call risk informed.

That's a traditional approach with nominal values and that is something that has been done over the last 20 years so that's nothing new. There's aspects of this discussion that are going to be deterministic, traditional approaches. There's going to be the traditional approaches with nominal values. Then there's going to be a very small piece, like this is saying, that would be truly a risk-informed exemption.

I think when we met with the industry last week for that middle section, the nominal values, they were using realistic conservative as kind of the verbiage to define that area so you can kind of know

what we're talking about.

This is just saying the basis for a risk-informed exemption is going to be Reg Guide 1.174. You do a delta risk calc as part of that. Then the last bullet is your bullet. Right?

MR. ARCHITZEL: Right. That is basically the same. The methods under the debris generation break size will be the classical safety-related methods approved.

CHAIRMAN WALLIS: For clarification, you said debris generation for long-term cooling. It makes no sense whatsoever. Would you put that into proper English somehow? It doesn't make any sense to me. You don't generate debris in order to cool.

MR. ARCHITZEL: The exemption only applies for the aspects of debris generation and transport as they relate to satisfying long-term cooling. It's probably misstated in the bullet. It doesn't apply generally to the long-term cooling criteria 50.46.

One of the key points for this technical basis is that the breaks larger than the debris generation breaks size up through the double-ended guillotine break of the largest pipe interactive cooling system. We still consider that those breaks are within the design basis of the plant.

We are looking to define and satisfy acceptance criterion for those breaks with functional reliability of necessary equipment and relaxation of some overly-conservative design base assumptions can be made.

In addition, the equipment necessary to mitigate may not need to be safe for either single fair improvement and some of this later on is a point where we do have some differences with NEI but along the lines of whether an exemption is required or whether it's a risk-informed or realistic conservative approach.

CHAIRMAN WALLIS: Overly conservative. We had this discussion yesterday. Overly conservative to me means that you're something like 99.99 percent sure it will work. You are never going to be 100 percent sure of anything. What might be a more realistic requirement would be 95 percent of something assurance that it will work. Unless you put it in some terms like that, I don't know what you mean by conservative or overly conservative or acceptably or whatever.

MR. ARCHITZEL: There will be specific examples later but some of the aspects can be in the NPSH area. You can go to cavitation on some of the pumps.

CHAIRMAN WALLIS: The words that they use like overly conservative doesn't mean anything until you put it into some sort of metric.

MR. ARCHITZEL: We clearly have to define where the conservatisms can be taken. That is one of the things we have with the NEI submittal. We need to reach agreement as to what areas can be relaxed for them to propose and us to accept those specific areas related to --

CHAIRMAN WALLIS: The only difference between this mitigated region and the really stringent region where you require all that's in the book is this business of relaxing some of the conservatives it seems to me.

MR. ARCHITZEL: There's more differences that we'll go into later when you take the risk-informed approach. When you take the realistic conservative approach you're correct.

CHAIRMAN WALLIS: Realistic conservative is a slogan. You have to define what it means in some operational form. It's a nice term. It's good but it has to be defined clearly so we know what you're doing.

MR. ARCHITZEL: I'll continue with the NEI evaluation guidelines. As I mentioned, the process

approach is to be included in those guidelines. The evaluation guidelines are to include a template for licensees to follow which would hopefully fill out some of those issues you were talking about.

It will be included in the safety evaluation report. At the bottom we'll review plant specific exemptions depending on how many there are. That could be quite a labor-intensive process depending on if the plants are headed that route or they are going the realistic conservative route.

Now I would like to get into some of the regeneration break size selection criteria. As I mentioned before, this is strictly for the purpose that we call debris generation break size and only for 50.46(b)(5) long-term cooling. We want to distinguish that from the work that is going on with 50.46 where we are also working on revised break size. This is a limited pilot event of that work and intended not to be inconsistent with it.

The break size that we are proposing are that all PWR licensees shall analyze up to the size of largest attached piping of the auxiliary piping and including the double-end guillotine break of any of those lines in the design basis.

Reactor coolant system main loop hot and

cold piping will also be analyzed with a size equivalent to the area of the double-ended guillotine of the largest attached auxiliary piping of the plant.

CHAIRMAN WALLIS: You seem to be redefining the design basis.

MR. ARCHITZEL: For the purposes of regeneration of treatment of debris regeneration break size only. That is where the question comes in about the exemption, do you need an exemption or not need an exemption. We are applying different rules for the treatment of the debris generation piece associated with the analysis of debris generation, how it satisfies 50.46.

CHAIRMAN WALLIS: Is it possible for a front leg to break with a hole the size of the largest attached piping?

MR. ARCHITZEL: I think the reason we picked --

CHAIRMAN WALLIS: A hole or something which is only as big as the largest. It seems very obvious.

MR. ARCHITZEL: The selection of that break size, I don't know if Matt Mitchell is here. I guess he's not. He's going to be here. The concept behind it for selecting it is the auxiliary piping are

more likely to break obviously. But then the treatment or propagation of that break into the remainder of the piping was a decision that we say we want the design basis rules to apply for anyone in the plant to find the worse location for debris.

It could be combinations of debris. For example, I guess the steam generator could be the quantity of debris so we did not want to rule out analysis of the main loop piping but we did choose to propagate the break into the loop piping with that size.

CHAIRMAN WALLIS: When the piping is going to break, the probability that it's going to stop the size of a six-inch pipe is sort of small but it is possible.

MR. ARCHITZEL: We don't really consider the main loop piping very likely to break. That's one of the reasons --

CHAIRMAN WALLIS: That's why you're doing this.

MR. ARCHITZEL: But we are taking a break and this is the -- we're not eliminating the analysis of a break larger than that but for these design basis rules, we are only requiring it to be applied to that size break. We can't rule out the double-ended

guillotine breaks and auxiliary piping. Oh, I just went to the bottom bullet there.

MR. HARRISON: I'll take this slide. Again, just stepping through the risk-informed aspect of this, one is you need to demonstrate that you meet the acceptance guidelines in Reg Guide 1.174. That's the delta CDF delta LERF calculations. It's more than just that calculation. You still have to address defense in depth and safety margins.

I guess at this point I'll give a little perspective. When we talk about that realistic conservative area, all it is is changing the input plan version to a code from conservative to nominal values and you inherently are changing margin. You are changing the margin of the analysis. That's just an observation. That is part of the evaluation to say is that reduction in margin going from a conservative value to a nominal value or realistically conservative value acceptable. Is that reduction okay.

CHAIRMAN WALLIS: That's interesting. You are using Reg Guide 1.174 in the context of the sump blockage problem. The sump blockage itself is not dispositive of the PRA. Is it?

MR. HARRISON: In some PRAs it's modeled.

CHAIRMAN WALLIS: It would seem to me it

would have to be. I mean, you are invoking a forced solution to something you don't have --

MR. HARRISON: I can walk you through the logic of how this is. If a PRA doesn't model it, what it's doing is it's inherently assuming it works. If I meet the rule, I inherently assume it works.

CHAIRMAN WALLIS: So you're going to go through all that logic?

MR. HARRISON: I can. It actually comes out very simple. When I look at a large break LOCA for this phase of it, you've got a large break LOCA and I've got a failure in recirc. I had to succeed in injection and then I went to recirc and I died and I failed in recirc because the sump clogged.

Now, the reason that happened is because the sump clogged. In a PRA if it is modeled and you only have one sump, it's one basic event. It's large break LOCA times sump clogged. Or if you did model it, you would basically say that's zero. The rule works. That's my ideal case.

When I look at the exemption, what I'm going to come in and say is I'm not at the ideal case. I'm going to mitigate it with some type of traveling screen, some active system. I'm going to add something. I'm going to have an operator action to

turn sprays off. I'm going to do something at the plant so I can use those nominal values and I can get success of a sump and it won't clog.

I can model that as a new event with failure probabilities and I can say the ideal case is zero. Now, I'm not going to be ideal. I'm going to have a failure probability with a large break LOCA and I can do a delta risk calculation. Whatever that calculation is minus zero is the delta.

CHAIRMAN WALLIS: You've lost the chance to do this then.

MR. HARRISON: If they want to come in for a risk-informed exemption and they are going to use a traveling screen or whatever, they are going to make a mod to the plant. They will need to address the fact that equipment can fail in a probalistic manner. They would have to come in at that point to do that. That is the simple way to do the calculation. I mean, you can make it -- if you've got two sumps and you've got four trains, you can make it more complex but for the vast majority of plants --

CHAIRMAN WALLIS: So does this delta CDF then define what you mean by adequate and mitigated capability?

MR. HARRISON: Well, what you've done is

you've shown that as long as -- you have to show still that with the functioning of those systems that it will be adequate. It's got to work. You can't just put something in, do the risk analysis and not have it work.

CHAIRMAN WALLIS: So, again, either it works or it doesn't. It's not a probalistic thing.

MR. HARRISON: Right. The probability is the fact that the system could break. You can still have failure. But functionally they have to show in its environment and the conditions it's under it will work. That's a functional requirement.

CHAIRMAN WALLIS: It will work itself is subject to assumptions and analysis.

MR. HARRISON: Right.

CHAIRMAN WALLIS: Which you are now requiring not to be as conservative as before or something?

MR. HARRISON: The simplest case would be if they do the nominal case, the realistic conservative case, and the only thing they've changed, they've changed it to nominal values and they've taken credit for the operator turning the sprays off. The PRA would be basically what is the probability of the operator not turning the sprays off.

It would be large break LOCA times he failed to turn it off, sump clogged, you've got breakage. That's your delta risk calc. They are going to have to deal with human factors on that action but does he have the time.

CHAIRMAN WALLIS: Will this be spelled out in some sort of guidance?

MR. ARCHITZEL: This is supposed to be -- there is a shortened chapter 6, I believe, of the guidelines and that's what we're talking about the additional submittal. In our evaluation that submittal will be in the SE and the guidelines, yes.

CHAIRMAN WALLIS: I would think it would have to be for completeness.

MR. ARCHITZEL: It is intended to be.

CHAIRMAN WALLIS: For clarity.

MR. ARCHITZEL: It has to be to go forward. You have to work pretty quick to get this done. We've talked with NEI and they have mentioned the difficulties.

CHAIRMAN WALLIS: So this isn't just sort of a hand wave risk informed. You actually work out all the steps that you have to go through to implement.

MR. ARCHITZEL: I think they are followed

in order.

MR. HARRISON: Again, it's unique because it's an exemption. It's not like a risk-informed licensing action where the premise is you meet the rules and you are just tweaking on a diesel generator AOT outage time. This is you are meeting the intent of the rule but you are doing it through an active system or you are doing it from nonsafety or you are relying on an operator action to get there. It's kind of getting to the rule intent through a different path.

CHAIRMAN WALLIS: I understand that the quality of PRA varies quite a bit between paths. Is there going to be some affect of quality of the PRA?

MR. HARRISON: Within the scope of this issue you are talking large break LOCA which is going to be a frequency, and you're talking about the mitigative systems.

CHAIRMAN WALLIS: It's a small part of it.

MR. HARRISON: This is a very small piece. Yes, there will be a PRA quality aspect but it's a very narrow focus to that because you are really dealing with just one piece. You still have to do an overall assessment of the baseline number. When you do the Reg Guide 1.174 you have to have confidence

that the baseline number is not above -- not considerably above.

MR. CARUSO: Let me see if I understand the baseline analysis. You said you assume the sump works. Typically the way the LOCA design basis analyses are done they assume a single failure some place like diesel generator or electrical system usually is the limiting failure. Therefore, one train or some combination of equipment isn't working. Is that the baseline that you start with?

MR. HARRISON: No.

MR. ARCHITZEL: I would say, Ralph, that would be one of the reasons you need the exemption because if you are going down this path, you need the exemption because you are not reading the single failure criteria but it would have to be demonstrated. If they say a single active strainer, that was nonsafety so that would be the case where an exemption would be required and then have to meet the PRA.

MR. CARUSO: I'm trying to understand what is being used to do this PRA calculation. What are the scenarios that are being compared? Is it a design basis LOCA as a design basis limiting LOCA scenario with the single failure versus the design basis single failure with a failure of the sump? What is being

compared?

MR. HARRISON: Neither. What this is a comparison of is saying the ideal case is zero. Zero risk from sump clogging. It works, it never fails. That's zero. That is my basis. That is what I would love to achieve.

MR. CARUSO: That's the assumption that usually goes with the design basis LOCA calculation.

MR. HARRISON: But in this case this isn't in the PRA. If a plant were -- if you were to look at a PRA for a plant for at least in the industry, in the majority you would probably not find a sump clogging basic event.

That inherently is because they believe the sumps don't clog so it's zero and that would be if everything worked wonderfully. The ideal base case is zero. That is what we want to achieve. Now, we are not going to achieve that in reality. You are going to put in a backwash system. You are going to put in a traveling screen.

It's got moving parts. It can break so we are going to do an analysis and say what is the reliability or the unreliability of that system including the support systems, the power that it takes, operator action if you have to start it r you

are going to do some off and on operating cycling. You have to put that into your analysis to come up with a number.

CHAIRMAN WALLIS: You have to put into it also the probability of it being able to handle the debris flow?

MR. HARRISON: Again, you have to show that for the worse case debris flow it will work so that

is --

MR. CARUSO: What is the definition of "it will work?"

MR. HARRISON: Again, that becomes the -- it's got to be able to not clog. I think the success criteria was net positive suction head has to be met for the pumps so that's how they are determining success.

MR. CARUSO: What about maintaining long-term cooling to the fuel?

MR. ARCHITZEL: It is presumed.

MR. HARRISON: If you have NPSH you are going to.

MR. CARUSO: Even if you pass all sorts of stuff through the pumps that get stuck on the inlet of the fuel it clogs it up.

MR. ARCHITZEL: This isn't the downstream issue we are addressing. The downstream issue still exist but this is not a discussion of the downstream issue at this point. The strainers should meet the same criteria for downstream that the screens would in general.

MR. HARRISON: But if you had a concern with valves clogging downstream, you would have to deal with that. Right now that's unknown.

MR. ARCHITZEL: We've had earlier discussion on that. You would have to make sure that the system will function.

MR. CARUSO: How does that get thrown into the model?

MR. HARRISON: That is not thrown into the model. That's the success criteria that says I can model this. In other words, it's my premise of if I can show functionally that this operation works this way, then I have turned it into a reliability argument of how reliable is the system in achieving that function. If I can demonstrate functionality under those conditions. Again, that's where --

CHAIRMAN WALLIS: That's the problem where the biggest uncertainty is. You are handling the bits you know how to do but the fact of whether or not the

screen will work is something to uncertainty because we don't know how to model the debris and all that stuff very well. That is sort of ignored somehow.

MR. ARCHITZEL: It would have to be part of the submittal by the licensee's associated risk informed approach. They would have to state what the reliability was and have vendor testing to support those type numbers. I mean, when we say it's reliable and operable, we don't mean they are just going to -- they have to actually buy something that works.

CHAIRMAN WALLIS: But if there wasn't any figure, though, about the probability of it working. You assume that it will be able to handle the debris?

MR. HARRISON: Maybe I can backup. In a risk-informed submittal there is not -- the PRA people aren't the only ones that do a review. We do the review of the PRA part of it but the deterministic traditional branches still have to make a finding that whatever is being done is going to functionally perform according to what it is designed to do. That determination has to be made. If they are using net positive suction head as a success criteria for that, then they are going to have to walk through how they come to that.

MR. CARUSO: Is that the appropriate

success criteria?

MR. HARRISON: You are asking the question about the downstream. There will be other aspects.

MR. CARUSO: I'm trying to understand what should be the appropriate success criteria. You say you're using NPSH. I understand the fact that you're using that. My question is is that what you should be using?

MR. ARCHITZEL: We believe it is.

MR. CARUSO: The regulation says you are supposed to provide long-term cooling to the core. It seems to me there are scenarios you can think of where you can provide lots of NPSH and lose long-term cooling to the core.

MR. HARRISON: There are. You could have a pump failure. Not a pump failure but you could have a diversion path or whatever.

MR. CARUSO: Just debris accumulation on the bottom of the debris filters on the fuel.

MR. ARCHITZEL: I guess what we're saying is that is a different part of this evaluation that we are doing. It's not part of -- the downstream is still included. We are still going to evaluate the downstream as part of the evaluation guidelines independent of whether it is risk-informed or

conservative. There are differences in this approach related to the issue you're talking about.

MR. LYON: This is more in line of reactor systems. I think what really is meant here is this criterion that you're discussing applies to the behavior of the screen at the sump and applies to is that screen remaining functional with respect to clogging. The downstream effects then follow afterwards and, as we're saying, would be a separate consideration.

MR. HARRISON: That is how I've looked at it.

MR. LYON: Does that help?

MR. CARUSO: I will have to listen to the rest of this. Keep going.

MR. HARRISON: Okay. The only other point here is that --

CHAIRMAN WALLIS: That's very strange because I would have thought the real thing would be make some probalistic treatment of the process of clogging itself. The existing screens there with all the calculations we now know how to do, there's only a five percent chance they will clog even though it's a compliance issue with conservative analysis you have to do it. But if there was only a five percent chance

they will clog, then you want to be able to put that in the PRA. The PRAs don't seem to be able to do that.

MR. HARRISON: To be honest, I gave you a simplistic look. Last week I drew a little fault tree on this and what you had was mitigation. The sump mitigation system failed with a certain frequency, unreliability. If it fails, you still have the chance that something will still work. Even if it does clog at that point, you still have the chance to recover. You can go through the LANL reports.

For simplistic purposes I went and said just to make it a simple calculation if the mitigation fails I'm going to assume clogging and I'm going to assume it happened so fast that I don't have time to recover. That's a simplification in this approach.

You could step back and say there is a probability the sump will still function even without mitigated capability and you could go through that. That makes it more complicated because then you get into arguments over what's the number. I just set it to one, focus on the mitigative capability, make sure its reliability is sufficient to address the problem recognizing in reality there's a chance you still would survive even without it. That's my

simplification. I'm sorry if that kind of misled us a little bit.

CHAIRMAN WALLIS: It may be what you have to do with the knowledge you have. But if the NEI methodology were good enough, it would be able to predict a probability of sump clogged or not getting adequate. It might turn out with existing plants it's pretty darn small even though it was a conservative analysis it looks as if they are all in trouble with the realistic probalistic analysis the probability of them being in trouble is only 5 percent. That would seem to me the rational risk approach. But because you are not sophisticated enough to put this physical uncertainty into probablistic terms, you are forced to do something else.

MR. ARCHITZEL: I think you have hit on what industry has portrayed as their approach being risk informed but not without this technique of doing delta CDF, etc. They maintain their approach that the volunteer is risk informed but they are not going to do the PRA analysis of it. They are going to draw high-level assumptions about the conservatisms there are in the analysis. I think industry does consider their approach risk informed whereas we really don't. We had considered it somewhat differently.

MR. HARRISON: If I can jump in, this is a slide I put in. In addressing the sump capability for large breaks, it's a multi-tier approach. The first approach is basically do the traditional design basis assumptions and show you have functionality. Show you have capability. If you can do that in your plant licensing, you can go home.

The next step you say, "Okay. I can't quite do that so for there upper-ended breaks I'll do analysis to a level and then for the ones all the way to the doubled-ended guillotine break I'll use more realistic values, nominal values, still conservative.

CHAIRMAN WALLIS: I don't understand. Why didn't you use them in the first place?

MR. HARRISON: Well, again, it's design basis rules.

CHAIRMAN WALLIS: But the design basis rule doesn't really say how conservative you have to be. It just says you have to be conservative.

MR. HARRISON: If you want traditional versus --

CHAIRMAN WALLIS: I don't really see the difference. I think you are playing around with two different things which are very difficult to distinguish one from the other.

MR. CARUSO: What is a licensee is currently not using Appendix K rules but is supposedly doing best estimate analysis methods for LOCAs?

MR. HARRISON: I will guess in that situation -- I'll just speak off the top of my head. I would say they are already on board to do that. They may change some of their parameters.

CHAIRMAN WALLIS: I don't understand what more realistic means again. Is it 50 percent chance of being right or is it 95 percent change of being right?

MR. HARRISON: We will have to get back to you on that. I know that's a running comment.

MR. ARCHITZEL: There certainly aren't any analyses along the lines of Appendix K best estimate in existence where there is some degree of blockage situation. Those are our fuel analyses calculations.

MR. CARUSO: All of the analysis whether they are Appendix K or best estimate assumed that clean water comes into the ECCS system from the containment center. They assume they are getting clean water. So if that analysis is a best estimate analysis, how do you make it more realistic?

MR. HARRISON: Now you are past where I'm at.

MR. CARUSO: That is a fundamental analysis of one of the best estimate methods out there. Clean water, good water comes into that pipe.

MEMBER FORD: You seem to be drilling down on a specific item. You seem to be drilling down deeper and deeper and deeper. Let me ask a high-level question. You've got this LANL report. Is this your position right now?

MR. HARRISON: That is the parametric study that was taking some plant specific information, overlaying it onto a generic plan, and then trying to do a judgment call what it could be.

MEMBER FORD: Looking through this the methodology, the very detailed methodology --

MR. HARRISON: You can call that methodology.

MEMBER FORD: If NEI followed this methodology, everything would be hunky dory. Is that correct?

MR. HARRISON: I can't speak for that but that is the methodology we used in establishing part of the generic issue. If the industry were to say, "We are going to look at our plant specific parameters with our plant specific design and walk through the LANL simple approach," I would think it would be

looked at favorably by the staff as an approach to getting a probability for sump clogging because that is what net result of that report was to come up with a probability of sump clogging and then multiplying it --

MEMBER FORD: Not having looked at the NEI risk-informed proposal in detail, how far are they off?

MR. ARCHITZEL: They don't have any risk informed approach along those lines. We are trying to point out the difference between the staff approach and the NEI approach.

MEMBER FORD: So you are miles apart.

MR. ARCHITZEL: No, I was leading off saying we are not necessarily miles apart when you consider the realistically conservative aspects that we were talking about earlier outside the risk informed. This is a subset of the solution, the risk-informed approach. The other is the realistically conservative side.

CHAIRMAN WALLIS: Is there anything which is conservative and not realistic? I don't understand this.

MR. ARCHITZEL: I guess I would give a name for the other approach.

MR. HARRISON: The last slide is really the risk-informed aspect.

MR. ARCHITZEL: Let me continue a little bit trying to get back on track here. Let me go into a little bit of the NEI proposal and try and highlight some of the differences. The breaks larger than the debris generation break size, NEI was proposing to only use pump break locations that were determined in accordance with SRP 3.6.2 and branch technical position 3.1.

Those are basically high stress locations and they have been approved for the LOCA dynamic effects in GDC-4. When you consider debris generation analyses in those locations since there are pipe restraints, etc., they wouldn't necessarily be double-ended guillotine breaks. They would be double-ended but the pipes couldn't offset, etc. The effective break size would be much smaller if those restraints were available.

There was an area then with that construct that would an unanalyzed type situation or a range of break size that weren't analyzed and they would be the break sizes that weren't at these high-stress locations. A large majority straightline pipe, etc.

At the bottom bullet I'm not sure this is

accurate because yesterday's slides NEI indicated they are still pursuing this approach. The staff position -- I'll go onto the next page -- I guess I would just say that I think NEI still has this on their slides and they still are asking us to consider these are the break locations for this treatment.

As far as our consideration of that approach, it's been -- we have had it before us in the BWR review and also during the year and a half when we are going over the ground rules document for this review and we don't believe that the ground rules associated with local dynamic effects apply to meeting 50.46.

We believe you have to go up to the full double-ended guillotine break and pick the break locations that result in that. We do require analysis throughout the large loop. Even in this debris generation break size, this alternate break size regime, to look for the worst locations and the worst combinations throughout the main loop piping.

Then the Reg Guide 1.82, as I note at the bottom, also has, as I said, the most variety to retype in areas with the direct path to the sump would not be restricted just to these high-stress locations.

CHAIRMAN WALLIS: When you say suggest, is

that your position?

MR. ARCHITZEL: We are using this somewhat as the basis but we have been consistent with this approach. What NEI and the industry was doing is attempting to risk inform the break size as well as risk inform by selecting these breaks that were in high-stress locations. A fundamental tenant that we had as we tried to parallel the 50.46 effort, we are still looking to mitigate the largest break.

CHAIRMAN WALLIS: The worse break could well be one which is not very big but has large debris in area and has the most direct cause to the sump.

MR. ARCHITZEL: And that would be on a design basis. They still have to go up to the auxiliary to attach pipe for that break anyway. That area is covered because that's required. We are only talking of the larger breaks.

For the larger breaks have the larger zones of influence, etc., we are still looking but in the realistic conservative rule, we are to address -- NEI was proposing this was the method to establish some of those conservatisms. We looked for them to identify other conservatisms and analysis that would drop the debris generation.

Maybe not be as -- I know you don't like

these words -- as conservative in the debris generation transport areas as opposed to selected break locations that make the break effectively not double-ended but single-ended. A different way of addressing realistic conservatism is the staff proposes. We are not necessarily tremendously far apart. This is one area we are still discussing.

CHAIRMAN WALLIS: Let's talk about realistically conservative. It's very difficult to predict when debris is being generated in one area whether or not it gets to the sump. The conservative approach would be some gets to the pump. That's conservative because it's sort of an upper bound. Now, suppose someone comes along and says, "Well, I think only half of it is going to get there." Is that realistic? How do you know it's realistically conservative?

Are you going to say, "Okay, you've done a lot of CFD calculations and only five percent show all of it gets to the sump and 80 percent of them show that less than 70 percent of it gets to the sump. Using some kind of judgment about what is realistic will allow you to assume 70 percent gets to the sump. Is that what you mean by realistically conservative?

MR. ARCHITZEL: In this case that is what

the staff had in mind.

CHAIRMAN WALLIS: Some kind of judgment by the staff.

MR. ARCHITZEL: NEI proposal and that's what we have to have the discussions on. What are the appropriate relaxations of these design -- it's all within the design basis.

CHAIRMAN WALLIS: It becomes negotiable whether it's realistic enough and conservative enough. Sounds like a bit of a nightmare for the regulator.

MR. ARCHITZEL: It has some difficulty but the tenant we're pursuing is to still maintain the double analysis.

CHAIRMAN WALLIS: That's good.

MR. ARCHITZEL: The NEI proposed a method which would not require an exemption request. They discussed how there could be a template. We could perhaps review a single plant and pursue it under 50.59. The staff does not really consider it is very likely. If an exemption is required for the aspects, if they need to meet Appendix K or not using single-failure criteria, there is some thought that initially any treatment of this along these lines because you weren't treating the double-ended guillotine with the class rules would have required an exemption.

We are not considering NEI's position, the industry position, that perhaps since we're still doing the analysis it could be an exemption that is not required. We haven't reached a final judgement on that. We are considering it. Certainly in cases where they are not doing single failure and not meeting the Appendix K rules, we would require an exemption to go down this path.

MR. HARRISON: I already kind of hit on this before but, again, the only point I would just leave you with is the last bullet. If you are taking credit for some true mitigation, not just changing input parameters, you would need to follow some sort of risk-informed approach to show that would be acceptable. That's it.

MR. ARCHITZEL: Any ongoing effort where we talk about the mitigative capability analysis, what we are talking about trying to develop are items we just mentioned, what assumptions can be relieved. For example, the regeneration area, transport, which conservatisms. The treatment of the equipment to mitigate and this is where we mentioned before it doesn't need to be necessarily safety related but reliable for the expected conditions and the acceptance criteria.

I would point out that with the NEI approach they may just be using their existing equipment with different analysis methods so then some of these aspects wouldn't come into play like the treatment of the equipment would be safety related and have to function in accordance with the rules they already have for the safety related and EQ equipment, etc.

And the NEI evaluation guidelines, Chapter 6 contents, we expect they are working on the exemption request and the template, as I mentioned at the bottom.

That really concludes this presentation. We are not that far off from NEI and the industry on this approach but there are differences were are examining.

MR. CARUSO: This is all going to be described during the SER that comes out the first of August?

MR. ARCHITZEL: Yes. But that is one of the reasons we have a meeting scheduled for the 29th of this month.

MR. HARRISON: Mr. Caruso, I would like to offer a qualifier. We will have a position. Whether or not NEI is able to do the same thing, that will be from their side of the house.

MR. ARCHITZEL: I think as a minimum we will do the risk-informed approach. There is no question that we can construct the risk-informed approach. For doing the realistically conservative, we don't need input from industry as to what areas we would relax when we go out on our own to identify those areas.

I will point out again, industry's treatment of that was to risk inform the break location which has the effect of changing the size of the sphere of influence. We don't consider that an appropriate method to treat this realistically.

CHAIRMAN WALLIS: So presumably any industry that finds that major expenses might be involved in doing it the other way, we want to choose this risk-informed approach.

MR. ARCHITZEL: The risk-informed approach of this as almost any plant could take it anyway if it's going to be with design basis safety related equipment so things like NPSH where you can allow cavitation if it's justified by the vendor and you can't in a design basis rules.

The plants would generally take it, I would think, if it's approved and on the plate and available. Some of those type relaxations are

available. I'm trying to think what other advantages there are.

I believe for treatment advantages there are. Oh, the turning off of the pumps, etc., when you are dealing with a large break LOCA. That is a clear advantage because the flow is such a tremendous driver of the NPSH requirement. If you don't need that for that large break, then --

CHAIRMAN WALLIS: That is sort of the public perception here. This generic letter looks very tough. Got to comply. Then it goes out there and these guys say, "Gee, we better comply." And then they say, "Oh, but there's a way to get out of it by doing this risk-informed stuff." I don't say that's the way it is but I'm saying this could be a perception. The risk-informed stuff is merely put in to make it easy for industry not to comply. I think you have to make damn sure that isn't the perception that's given.

MR. HARRISON: The point I would make there is if you are installing mitigated capability, the risk informed piece it's got to work. You are complying with the intent of the rule because it's going to function. But you also are recognizing that it's not a passive system that just sits there. It's

got active parts and it can break so there is actually an element that says what is the risk of that.

CHAIRMAN WALLIS: Put across this is a more rational way of deciding what is the appropriate action.

MR. JOHNSON: Exactly. And, to be honest, you know, for the 50,000 foot level I think the perspective is, and Donnie didn't talk about the initiating event frequency, but what we've said, or NEI did, I guess, in their presentation, what we are in essence doing is looking at these larger breaks that aren't all that likely and we are looking at what remaining mitigation exist likely to that mitigation being successful.

We are saying that -- the licensee would be saying that in essence we are going to demonstrate that the sump can be fully successful and let's suppose they are adding a backflush system or whatever. They are not too trained or it's not fully safety related, if you will. Any delta risk associated with that is acceptably small.

That is sort of the Reg Guide 1.174. It's the total spectrum of looking at the initiating event and the mitigation capability to demonstrate that, in fact, we are meeting what the rule says as required

with this system and any deltas from how we are apt to find that is the result of --

CHAIRMAN WALLIS: What is the delta risk of doing nothing?

MR. HARRISON: That is the --

CHAIRMAN WALLIS: Suppose the delta risk of doing nothing is acceptably small? Is that okay? They don't have to comply?

MR. HARRISON: Let me deal with that a little bit because the big issue with this becomes the large break LOCA frequency they use. Remember yesterday's chart. The industry has the preliminary results from the elicitation. It's got this nice long tail on it that you can actually go to 14 inches and say the probability is X. PRAs don't do that.

We first need to backup and understand why a PRA stops at six inches. The reason they stop there is because you do the break size determination to determine what your success criteria or what your plant response is. It's usually around six inches and sometimes maybe a little bigger or smaller.

Around that point you can no longer -- you won't have this intermediate phase where you have high-pressure injection capability and then you go to low pressure and you'll depressurize such that you are

stuck with just low-pressure injection systems. That's why you get that six-inch data point.

Again, we can connect dots on a graph. Those aren't really there. Those are actually individual points on that chart. You need to be a little cautious of that because it's not a fine line. You can't interpolate between the two points and come up with an answer.

You've got a point at the six-inch line where you are saying at this point I now am relying strictly on low-pressure injection systems, low-pressure recirc. I'm going to model it that way in my PRA. That's why that's there. That is a frequency of exceedance so that's the frequency of a six-inch or larger break with no -- you know, does a 14-inch break have a lower frequency? Yes. How much lower?

We don't model that in the PRA because the key is the six inches because the plant is going to respond the same way medium and low-pressure injection and recirc for our success criteria. So you need to be a little cautious when we get these tails on these lines and people start saying here is a probability out here at 10 to the minus 9 for something because there is nothing there. There's no data. Right now there's no elicitation because that's not final.

CHAIRMAN WALLIS: I understand. Capability can be shown to introduce an increase in risk of 10 to the minus 5 or something. It is acceptable by 1.174. But then the numbers we've got on that curve once you get beyond the six-inch break you're below 10 to the minus 5 anyway so you simply say we'll do absolutely nothing and forget it. Let it not work. Who cares?

MR. ARCHITZEL: That's the other option I think we're talking about.

CHAIRMAN WALLIS: You're below 10 to the minus 5 anyway.

MR. HARRISON: No, because, again, you still have to comply. There is still a compliance element there.

CHAIRMAN WALLIS: It seems sort of ritual then because you can comply with something which doesn't work and you still meet your 1.174.

MR. HARRISON: You either comply or you get yourself exempted from that rule. If you are going to exempt, you are going to have to use a risk-informed argument to get that. If the numbers were low enough and we had a handle on it and we knew them well enough and the value was 10 to the minus 7 and we

knew that, then, yes, someone probably could come in and say, "I want an exemption from the rule because the value is 10 to the minus 7," and everyone agrees.

The issue that staff is raising, when they do this double risk calc is to use the NUREG 11.50 numbers because I think everyone will recognize those numbers are conservative from best information we have. Remember that chart from yesterday and it's the highest one on the graph. I mean, you could have some flexibility there but we don't want you starting 10 to the minus 5 and saying, "Okay. My sump only has to have a .001 capability and I'm below the line."

We don't want to be in a gain when we're doing that. We have pushed for at least having a sensitivity calculation that says even using the NUREG 11.50 mean value, the system will be reliable enough to meet acceptance values and then we would have the confidence.

You have kind of bounded your uncertainties of whatever comes out of the elicitation process. We'll have a handle. We will have been greater than what they had because I don't think they are going to come up with two orders of magnitude higher than what they got.

CHAIRMAN WALLIS: What are my criteria for

any of this making sense? It sounds very technical and involved. It could be explained to an intelligent person like one of my colleagues who is not necessarily in the engineering department about what's going on and what's the basis for these guys making these decisions and that person says, "Yes, they have made a sensible decision."

I think you've got to somewhat put this in terms which isn't all tied up with you need to do it for the regulatory purposes but someone has to be able to explain it in some statement of consideration or whatever it is so that it's absolutely clear to somebody who is an intelligent sensible member of the public that reasonable decisions are being made.

MR. JOHNSON: I just would say it's interesting you mentioned statement of consideration because one of the things I said yesterday was that we wanted to make sure that this risk-informed approach is consistent with where we are going with CFR 46 risk-informed rulemaking.

The commission has signals their intention with respect to how we do that risk-informing using results of the solicitation process. One of the things they have given us a clear signal on is even if we should get to a place where we decide that the

initiating event frequency of the break size it would take is so low, for example, that you wouldn't need from a Reg Guide 1.174 perspective be able to demonstrate mitigation that is from the delta CDF perspective.

We would still want to ensure that licensee can mitigate should they have a bigger less-frequent less-likely break. That is our insistence and that is one of the stark differences between what you hear us talking about in terms of high-risk informative approach and what NEI talks about in terms of this realistic approach. We believe it's necessary to absolutely talk about what that change is

CHAIRMAN WALLIS: And that's where you have to be clear about what you mean by adequate mitigation because adequate mitigation could be a 50 percent chance of working which probably is not adequate.

Are we up to Michael's summary? Are we getting there?

MR. HARRISON: Yeah, I think we're done.

CHAIRMAN WALLIS: I want to thank the two previous speakers.

MR. JOHNSON: I just wanted to close with a couple of points, if I could, just to remind us that

the real purpose of today's and yesterday's meeting I think was in addition to focusing on the generic letter, I clearly wanted to focus on the generic letter and have you understand where we are on that and buy in on where the staff is going with respect to the generic letter.

We also wanted to talk about the status of all the things that are ongoing with respect to resolution of GSI-191. As we've talked, in a number of instances there are a number of those activities that are ongoing.

That much is certainly clear. I believe we made good progress on giving the aggressive schedule that we are on. Obviously we haven't completed all the things that need to be worked on. There is a meeting in August where we focus in on the evaluation. I know you are going to be -- we definitely want your perspective on our review, on our safety evaluation where we look at what NEI has proposed with respect to how these sumps would be evaluated.

We certainly appreciate the willingness of the subcommittee to focus on the key areas that are potentially most problematic. We are going to talk and hopefully we can have a few minutes at the end of

the day to talk with you about what those key issues are and how we can perhaps provide you additional information on those areas so that when we get to August, that meeting is as productive as we can possibly make it.

You know where we're coming out and you've had a chance to consider it so we can get a good result with respect to that meeting. Again, we are going to try to discuss that at the end of the day if you will permit us.

Regarding the generic letter, I do think it's beneficial, has been beneficial to talk about the generic letter. I think we have made clear improvements in the generic letter in response to all of the comments that we got on the generic letter. I did want to mention to you that I did hear your perspective about making sure that when the full committee meets that senior management be here to talk with you.

Dr. Sharon would have been here today. It turns out yesterday and today are also two all-day working meetings on 10 CFR 50.46 so he's been off engaged in some of the very things that we've been sort of alluding to in terms of the conversation today. We'll definitely make an effort to have his

presence in addition to my presence in a couple weeks when we talk about the generic letter.

In addition to that, we will have a generic letter in a couple weeks that is much more finalized in terms of the final words. We are going to make every attempt to get that as far along as possible. Having said that, again, I think if you look at where we are making changes, we've got a generic letter that is more simple, more understandable, that is more direct with respect to what it is we are expecting of the industry in terms of the request for action, that is clear about where we are with respect to the backfit issue. Hopefully you've heard enough to wrap your hands around from a concept perspective where we're going with respect to the generic letter.

CHAIRMAN WALLIS: One question that was raised by several of my colleagues was why put it out before we have this approved guidance?

MR. JOHNSON: I understand. I was going to actually talk to that when we were having the generic letter discussion. I think actually -- Ralph, correct me if I'm wrong or John, I think we intended early on perhaps that those two things would be happening at the same time.

We have made an adjustment to the schedule and the issue of safety evaluation. To be quite honest, they could come out at the same time, although I think it's easy enough to issue the generic letter with this change that we're making to the generic letter that ties the actual implementation date not to the generic letter but the Se issuance date. I don't think we lose anything with respect to that. That is where we are with this.

CHAIRMAN WALLIS: There are a lot of delays in putting out the guidance and this wouldn't be good it seems to me. You've got everybody excited that they are going to have to do something and then they are waiting and waiting and waiting and waiting.

MR. JOHNSON: I understand. Again, we are working very hard to make sure that we don't have those expensive delays.

CHAIRMAN WALLIS: I have a question for you. That is, you folks always seem to think you can regulate knowing what you know. Sometimes you need to know more and so you say we need some research. We need to find out more about this thing before we are able to make a decision.

Is there anything that is being pointed out in the course of this work which has led you to

conclude that you really need to know something else in order to be sure of what you are doing or is there some ongoing research that you still need to do but you can still make a decision today but you still need to keep the research going because there are certain things you will need to know in the future?

MR. JOHNSON: There are areas. I don't have the list with me but there are certainly areas. In fact, we were talking over the break about the possibility that there would potentially be the need to do some confirmatory types of research on some of these issues. That is how I would characterize it. We recognize that is certainly exist as we press to make a decision based on what we know today to resolve the issue.

CHAIRMAN WALLIS: What you know today could have been better if some anticipatory research perhaps had been done before. It's harder to justify the anticipatory research except in retrospect.

MR. JOHNSON: Thank you for your time.

CHAIRMAN WALLIS: Thank you. Are we happy now? Do my colleagues wish to raise any other points? This is the time to get the big picture.

MR. JOHNSON: I did ask, in fact, if we could have a few minutes at the end of the day. Is

that possible?

CHAIRMAN WALLIS: Yes. I was wondering when you said you were going to come back. I thought you were giving your --

MR. JOHNSON: We'll be back again.

CHAIRMAN WALLIS: You're going to come back at the end of the day. Okay. That will be good. Thanks. I welcome that.

With that, I am happy to break and we come back at 12:35. That's a strange time to come back. Just come back here at 12:30. We'll resume at 12:30. We'll take a break now. Thank you very much.

(Whereupon, at 11:35 a.m. off the record for lunch to reconvene at 12:30 p.m.)

MR. MAYFIELD: I'm Mike Mayfield. Tony Hsia and B.P -- I think you know B.P. I figure now we have a good in with the subject. So if you really have somebody you wanted to abuse, it's B.P.

At any rate, we appreciate the opportunity to be with you this afternoon. Our role in this at this stage is to support NRR in their activity to bring about the resolution to GSI-191. We have a number of specific research activities that we'll describe for you this afternoon. What we're doing and ongoing and planned, and how we see bringing those

issues to resolution in a way that they support the staff's activities.

And with that, I will turn it over to Tony.

MR. HSIA: Thank you very much.

Good afternoon. My name is Tony Hsia, I work in the division on engineering, engineering research applications branch. Section chief in mechanical and structure engineering section.

And with me we have Dr. B. J. Jain, you all know very well. And we also have supporting us Bruce Letellier from LANL who will presenting part of these -- I call it tag team approach because we have several different projects. We also have Dr. Leetai Yang from Center of Nuclear Waste Regulatory Analysis also called Southwest Research Institute to support there the people who have done some analytical work related to the integrated chemical effect tests.

So let me just begin by -- what I would like to present to you is the whole physical phenomena associated with GSI-191. I'm sure you're very familiar with it, but I still would like to put it in its background.

As we've seen before, and certainly yesterday and this morning, there is still issues or

still would like to have a clear definition of resolution of the LOCA break size and where the LOCA is going to occur, and also from that point on then we can determine the debris source, what kind of debris source we have, whether it latent debris or LOCA generated debris and generation of the debris. And then from that point on it's debris transport. Afterwards it will be potential chemical reactions to what we call a potential because we don't really know for sure. We have a lot of engineering judgment and some analysis, but it will all be confirmed, we believe, by the integrated chemical effect tests. The final effect will be on the screen head loss and the screen performance.

I should add one more bullet, that is a downstream effect. Some of the debris will go through the screen, ended up with the pumps and valves and may even be in the fuel channel. I know the Germans are very concerned with those issues.

Now, first the technical challenges in solving this whole issue, it's a concerted effort from the staff, both NRR and Research. Like Mike said earlier, our main goal is really to support NRR for the resolution of GSI-191. And we all recognize that this is a very complex phenomenon and it depends on

what you have in your plant, the design of the plant, the procedures you have whether you have sprays, when the sprays come on, what kind of recirculating flow you have and so on.

Some of the Germans they'll use containment spray. From that respect they have simplified the issue quite a bit.

And then the knowledge base we're still learning. There are still things we are trying to search, trying to understand better. From the get-go of LOCA generation of debris and transport, CFD calculations, chemical effects and so on. That's why we're doing all these works. And we earnestly started doing this technical research work since year. I remember we had meetings with you in September. And then from that point on we have received your recommendation and comments, and we're responding according.

In this viewgraph the test data on jet expansion, ZOI, the damage pressure of different insulations. And there are very much plant specific. Some plants, depending on the insulation and also depending on the design and layout of your plant, configuration of your plants.

CHAIR WALLIS: You say that the test data

on jet expansion was designed specific and yet there seems to be some generic model of the jet which is supposed to capture --

MR. HSIA: We're doing the best we can to capture every plant, but the distance from your original break to where the target is is very much --

CHAIR WALLIS: It is a local geometry --

MR. HSIA: Yes. Yes. And what kind of insulation you have, whether it's cascade cassette whether RMI, whether it's fiberglass. In the U.S. we're mostly fiberglass. RMI, in a way that's fortunate compared to some people.

CHAIR WALLIS: Well, I don't know if there's any test data which tries to model these design specific --

MR. HSIA: Well, I'm referring to the knowledge base test data we have international that we have had. And we have documented the knowledge base. And I will talk a little bit more about the knowledge base report later on, what we plan to do. Actually, B.P. will talk about that.

MEMBER FORD: This morning and yesterday a fair amount of discussion about the gaps in the knowledge base.

MR. HSIA: Yes.

MEMBER FORD: And you were talking about a question of the judgment and the timing, the prioritization of all these various questions. And this is obviously just a high level calculation of all the individual questions. Will you be showing the timing prioritization of all these tests and fixing to potential generic letter --

MR. HSIA: Okay. As far as Office of Research is concerned, our focus in the last year has been on chemical effects, has been on the test to figure out what the chemical effects will have on head loss, insulation and the downstream effects and latent debris. We have not done research since last year on the jet model.

There is an international effort that maybe solid shortly we are considering as far as NRC is concerned. We will recommend to our management we will participate.

CHAIR WALLIS: There is international effort on this jet modeling?

MR. HSIA: It's a test. It's a full scale test. It is supposed to be sponsored by OECD. We have participated since the workshop, I know Dr. Kress was there. That was raised, but the response was not that good. But later on there were other meetings in

OECD. OECD is trying to solicit their interest.

CHAIR WALLIS: Is there a proposal to run a full scale test?

MR. HSIA: Yes.

CHAIR WALLIS: So it's not a real thing yet?

MR. HSIA: No. And so --

CHAIR WALLIS: The idea is to test in realistic surroundings --

MR. HSIA: Yes.

CHAIR WALLIS: -- with insulation and pipes and things?

MR. HSIA: Yes. Each country was asked to provide their needs, including us. So we have provided our needs as to what kind of jet we're looking for, what kind of break we're looking for, what kind of insulation we want --

CHAIR WALLIS: This would then become a test of the NEI methodology when we get some results from it?

MR. HSIA: But unfortunately that is not, in my view, going to help the immediate need of --

CHAIR WALLIS: That's very interesting that we're going to have this drama played out and by the time 2007 when everyone would like to say

everything is finished, we're signed and it's done, we begin to get new experimental data. And it'll be interesting to see what that tells us.

MR. HSIA: At least we recommend to our management to approve we participate in that based on two reasons. One, it's always good to have additional knowledge. Two, that's international activity we're encouraged to participate. And also we would like to see -- we don't want to get into a situation where we went along one direction, we thought we know what's going on and there's a big effort somewhere else and proved that you guys missed and that. So that's why we --

MEMBER RANSOM: Is there anything or characterized about that effort yet?

MR. HSIA: Nothing official. I have attended one meeting at OECD. The lead is IRSN in France, their equivalent of the research. Their focus at that time was in the very narrow confinement in the steam generator compartment with their type of insulation. So they want to solicit international participation, everybody's got different needs.

I think the steam generator welding is a good location that we could use some tests for, but we don't have the same kind of confined compartment like

the French do, and we have different insulation.

Basically at this moment as far as I know they're thinking about testing 12 inch and 6 inch and 3 inch break with the assorted type of insulation material if the project goes on. Now right now there's no international interest, not enough. The project I don't believe will go. So it's still a question mark.

CHAIR WALLIS: Is there going to be any U.S. participation in this?

MR. HSIA: Yes, we recommend to our management that we do that.

CHAIR WALLIS: Will there be some funding from the U.S.?

MR. HSIA: Yes, according to the OECD funding scheme.

MEMBER FORD: Could you give us an idea in your last bullet is the timely resolution. In your opinion what is timely?

MR. HSIA: Timely resolution is we're working as hard as we can to get the integrated chemical effect tests to support at the tail end of the generic letter issuance. We will not get the data until August, sometime. The filamentary data, we will not get all the tests done until November time frame.

And I want to point out, that's a cooperative effort between industry, EPRI and us. We have gone through quite a bit of discussion and many meetings. And I think we have a very satisfactory test plan. I would like to brief you on that also.

Okay. Let me go to the next viewgraph.

CHAIR WALLIS: Are there any other kind of international effort going on? You mentioned the jet model, is there any other kind of international --

MR. HSIA: Associated with what they call the PWR sump, the regeneration project OECD. The deal was if we participate in that, you can also get data from the French test at ELISA Group, that's at Slovakia. That I believe is going on right now. But that's strictly for French glass wall with their environment, with their insulation. So we'll get that data, which is not going to be that useful for us. However, the stipulation is if you participate in the big program which is going to cost a lot of money overall, you will be able to have the privilege of specifying additional tests to be run at that facility at your own cost.

CHAIR WALLIS: Now the test in Slovakia, what does that consist of?

MR. HSIA: That's strictly chemical test.

CHAIR WALLIS: Only a chemical test?

MR. HSIA: Only a chemical test. I'm not aware of any other jet or jet impingement or jet debris generation test going on internationally at this moment. Correct? I'm testing with Mr. Blomart.

MR. BLOMART: It may be a -- a little bit nearer to OECD to perform this large test, jet test. (Off microphone).

MR. HSIA: That's from your point of view. But IRSN seems to --

MR. BLOMART: IRSN is on the other side of the view.

MR. HSIA: Yes. Literally.

MR. BLOMART: But I think that I wanted to have it introduce on the right side of the river.

CHAIR WALLIS: So this is --

MR. BLOMART: No. You know (off microphone).

CHAIR WALLIS: It's called the Okhotsk Sea in Russia.

MR. BLOMART: (Off microphone).

MR. HSIA: You are very cautious. So are we. We're very cautious.

CHAIR WALLIS: So this cold start, that is something which figures into our noise base?

PARTICIPANT: Yes. We have mentioned that as to what we know. We have not directly made reference to those.

CHAIR WALLIS: But you were able to use it to test some of the methods?

PARTICIPANT: It's contributed to our understanding of the methods.

CHAIR WALLIS: And your validation and evaluation of the NEI work?

PARTICIPANT: I'm sorry?

CHAIR WALLIS: And your evaluation of the NEI work, for example, it could contribute to it? Your NEI methodology. Presumably we have to have some realistic representation of whatever test data is available.

PARTICIPANT: Well, I think the German test data would amount to one bit of information which, as Bruce points out, is proprietary. One bit of information that the overall --

CHAIR WALLIS: But do you use it?

PARTICIPANT: Within the limits of what you can and cannot do with proprietary information.

MR. HSIA: So the way we think of this potential OECD project is as a minimum it should provided with additional data, and also even if when

we're all down and we're marching along with trying to resolve this NEI guidance document, maybe those test results will provide some room for conservative maybe -- we're hoping that we can say, hey, we've allowed plenty of conservativism. That was our best hope.

Having mentioned those challenges, the next viewgraph I would like to present to you how the staff, that's NRR and Research and industry what actions we have taken to address those challenges.

As you all know that we have had February of this year, we have had an international work workshop on some performance, which I personally and other people I'm sure learned quite a bit from other countries way of dealing with this. Like I mentioned earlier, the Germans, the Switzerlands, they used the leak before break approach in addition to in the Germans case with no containment spray. So that right there simplifies this problem quite a bit. In this country we're doing that, as far as I know, so we have a different challenge.

The chemical reaction analysis, like I mentioned earlier, it's the Center of the Nuclear Waste Regulatory analysis. I will get into a little more about that project. That's like a lead in to our integrated chemical effect tests to help us define the

test parameters, to design the test loop and also in the future we can use these results, hopefully, to extrapolate whatever we have learned from that integrated chemical test.

And the third bullet really directed toward NRR's role to evaluate NEI's evaluation guidance.

And the fourth bullet I would like to say we would like to provide supplement to the knowledge base report. We have taken your comment from last year and we agree with you, and we are going to provide a supplement to at least update analytical and experimental results when they become available and better organize and consolidate the knowledge base. If it is out of date, we would like to point it out. If it is inconsistent, we would like to point out so make it clarify this whole document.

PARTICIPANT: We heard you and when we went back and looked at the knowledge base report we found ourselves in agreement that this is as we had advertised it, and as you picked up, is a collection of information. We want to go back now and look at that and provide a better assessment of -- well, it's nice that it's a collection of information, what are you supposed to do with it?

CHAIR WALLIS: Because some of it supersede other bites of it and so on.

PARTICIPANT: Exactly. And what of it are we more comfortable and less comfortable. The intent is to clean that up and supplement with any more recent information.

CHAIR WALLIS: Now when is this going to be done?

MR. HSIA: We plan to do this earlier next year, after we're done --

CHAIR WALLIS: So this is long after the guidance comes out?

MR. HSIA: Yes, it would be after the guidance.

PARTICIPANT: I think between us and the people in the industry that there's a pretty good sense of what of the knowledge base report could be used. So it's not like people are hanging waiting on that. But we felt like it was important to clarify the record and go back and clean it up.

CHAIR WALLIS: All right. It's also not as if there's going to be conflict between NEI's methodology and your consolidated knowledge base?

PARTICIPANT: That is a possible outcome--

CHAIR WALLIS: That would not be

desirable.

PARTICIPANT: I'm not too worried about it because there's been a lot of active dialogue that that is a possible outcome.

MEMBER RANSOM: Is there anything towards refining that, that database?

PARTICIPANT: Well, that's part of what Tony's going to talk about is additional information and when did the additional data been made available since then. We'll factor that in to the extent that it's practicable.

MEMBER RANSOM: I was just wondering if there are any efforts ongoing to try to improve what's in there?

PARTICIPANT: I think that's part of the international activity. So presumably there would be yet another supplement to that knowledge base report as assuming that this international activity goes forward.

MEMBER RANSOM: You don't have researchers working on this right now? Do you have any active programs right now continuing?

PARTICIPANT: Tony's going to talk about what active programs we have. We've done some additional work which would figure into that. The

Council insulation report would be one piece of information that would figure into it.

MEMBER RANSOM: Okay.

MR. HSIA: Yes. The next viewgraph I'm going to talk about the activities. But the community of engineers who work on this particular issue, sump performance, I think you can look at this room, the majority of them are here. And it's a very close knit group because we dialogue quite a bit with our colleagues NRR and NEI and EPRI. So although there may not be a consolidated documentation right now with the knowledge base, but I think all of us are pretty much plugged in to what's happening. In that sense, that's reassuring. Except the utility, I'm sure the utility folks will get the latest information NEI.

This viewgraph I want to just lay out the projects we are going to discuss to brief you today. We'll start with the effect of chemical reaction on head loss, that's one project.

Then we'll also talk about the head loss due to the calcium silicate, that's a particular type of insulation that's particularly challenging as far as head loss is concerned. So we had a project on that.

What I call the ICET, integrated chemical

effects test, really is to do a realistic test to see whether we will have -- what kind of chemical reaction we'll have, the corrosion products, and most importantly this gelatinous material. Again that's pointed out by your committee to say that's as a result of TMI. And this test is not trying to duplicate TMI. It is trying to use the most realistic situation that we know of to represent most of the plants and see what kind of chemical reaction we may have.

Another project is latent debris characterization. I think yesterday you talked, some of the presentations were on that. And we'll also discuss.

And then eventually we'll talk about downstream effects.

And the next two bullets I think we already touched upon, is we are considering participation in the full scale degree generation tests as well as the last bullet, again, relates to the chemical reactions because -- we're pushing the envelop right now, because the insulation material, the leaching rate of the insulation material that's prevailing in U.S. plants, there's no data that I'm aware of. We have Dr. Jain from the Center here. If

I've misspoken, please correct me.

So we were thinking of we should do a test. So right now for the analysis we are using the approximation of the glass log, which is also a glass material, that's used in the Yucca Mountain study. So they have some data there. But we would like to recommend to our management to take real data under the condition, the thermalhydraulic conditions such as borated water and with temperature and see what kind of lesion rate we have, as well as the corrosion data we have from that program are from the '60s. So we thought it would be a good idea of we can get some latest corrosion data. Maybe it's the same, maybe it just validates that. But I think while we're at it, maybe some spend some money and get that updated.

So those are the two last bullets.

MEMBER FORD: Could I just ask a question?

MR. HSIA: Sure.

MEMBER FORD: OECD test. It is a test, singular?

MR. HSIA: Correct. Well, no, I take that back. It is a series of tests.

MEMBER FORD: Okay. The reason why I asked the question was that over the last few days and, indeed, in our September letter there is a whole

lot of questions raised by ourselves and also by Los Alamos yesterday on things to do with this zone of influence and the deputy generation and the physics of how the deputy is created. Will all those questions, at least the higher priority aspects for all those questions, be tackled in that program, the OECD program?

MR. HSIA: I'm imaging what the final test might -- nobody has the test plan. But based on discussions at the meeting I went to I believe the zone of influence, the way it really happens will be part of the data. Because whatever confinement we have, the conceptual design of the test is you put some kind of vessel there, a steam generator maybe. You have a pipe and you break that and then you direct the break -- it's really a ruptured disk, at different orientations, at different size of break. So that will provide valuable data as far as zone of influence and the impact and damage for that particular distance and insulation.

MEMBER FORD: And you'll be doing different insulations, not only the French insulations but our insulations?

MR. HSIA: Yes. The Germans has different and the Belgium -- yes. So the final test plan has

yet to be --

MEMBER FORD: So this is a fairly long test series?

MR. HSIA: Yes. That's why --

MEMBER FORD: And so it will not impact the idea that the industry has to come in September 2005, as I understand some of the data you've given to us, with their plant specific analyses?

MR. HSIA: I don't believe the timing is such that it will have -- I don't know for sure. Have enough date before April 2005. If I recall that's the date that licensees is supposed to come and say I'm okay or I'm not okay.

MEMBER FORD: Okay.

MR. HSIA: I don't think it's that timely. Because the facility has not been built. The components are there --

MEMBER FORD: What happens if after they've done these tests there's a oh, heck we have missed out this? The stations may well have spent a lot of money changing things around to be in conformance with the current regulations. So what do we do in that situation?

MR. HSIA: If we are way off, then we need to go back and bite the bullet.

PARTICIPANT: I think that that concern is one that we've all had at the same time. You can't ignore the fact that this work has at least at 50/50 chance of moving forward. And we felt like it was important to make sure we understand what's being done and perhaps influence how it's being done to make sure we're getting information that's most applicable to us, and then evaluate what it means. And if you come back saying we are off by so much that it would negate conclusions, then I think we would have a somewhat different dialogue with our colleagues in NRR, and I suspect they'd have a dialogue with the industry.

The other possibility is you come out on these experiments saying gee, you know, we're way more conservative than we need be and perhaps somebody that was on an edge of having to make a decision, influence them one way or the other.

So you just don't know which way this could go for sure. There's a possibility it could go in a way that would suggest licensees in this country would actually do more, it could equally go the other way. And the other possibility is it you come out of it saying, you know, we weren't far off. This is pretty good.

MEMBER FORD: So in the prioritization of

all these technical challenges was there a decision tree made as to if we are off by this assumption as to our current technology what would the impact be on "risk" in the overall sense, delta CDF product perception, the definition of risk? What test analysis done --

PARTICIPANT: Formally, no. You're left -- we know the perceived significance of this issue and qualitatively if you're off by a lot, then you're going to need to do something about it. If you're off by just a little bit, then you're left with what's a little mean, how far in error are you and does that negate prior conclusions.

MEMBER FORD: Yes.

PARTICIPANT: So it's more qualitative.

The given, for me at least, and this is something that we will propose to senior management. So it's not a given that we're going to go to do this. But the proposal is likely to be that we would engage in this program to: (1) make sure we understand what's being done and what you can and cannot make of the results. That often times gets to be more important than the results themselves, is to understand what the constraints are on those results.

MEMBER FORD: Right.

PARTICIPANT: The secondly the opportunity to influence the test program so that we get as much directly relevant data out of it as we can get.

MEMBER FORD: Okay.

PARTICIPANT: And then the results go where they go and we are left having dialogue with the other stakeholders.

MEMBER FORD: Thank you.

MR. HSIA: I think that's it on this file.

Okay. Now we start to get into more technical detail as to this afternoon's presentation.

This is the outline of the order we're going to do this. B.P. is going to brief you on the chemical effects on head loss, and I will come back up to brief the ICET project. And B.P. will take care of the next two, calcium silicate head loss test, latent debris characterization and Bruce will discuss the downstream effects test. And B.P. will at the end will summarize to say what our plan on updating the knowledge base and our view on Reg. Guide 1.82.

So with that, turn that over to B.P.

MR. JAIN: Good afternoon. This is B.P. Jain.

I will provide a brief background on the Research effort regarding chemical effect on head loss

tests.

These tests were concluded last year and we had briefed the Committee in February and September and reported the head loss results. So this more for continuity and leading what Tony is going to describe on the integrated tests.

The bottom line of the tests which we performed last year was that if gelatinous material is formed it can increase head loss. And the second conclusion was that if the NUREG 6224 correlation may not apply. So that's really the bottom line of those tests were.

Again, the concern is the ACRS identified back in February 3 that regarding the TMI evidence of gelatinous material. And based on that we conducted a limited scope study to assess that what is the potentially of chemically induced corrosion product.

Now, we artificially induced the precipitant to study the fact on its head loss. We did not perform an integrated test, and that's where we are doing it now.

The next one shows an example of what sort of head loss we observed that test, which is you can see in the blue line, that's the baseline. And any other precipitants, be aluminum, iron or zinc, it's

always higher than that. So we concluded that precipitant it formed in gelatinous form, it will increase the head loss.

Now we reported it erodes, and I think the industry is fully aware of those. And it's on ADAMS, the LANL report. And we had a peer review performed on these tests as well. And, again, principle findings was really two conditions. One it has to be formed and two it need to be transported to some screen. If those conditions are met, then it will increase the head loss.

And the second important conclusion was that such material if formed traditional correlations may not apply.

So these findings lend credibility to the concern the ACRS raised, but in itself are not sufficient for plant specific quantitative analysis. I guess in order to address that we started a new program that integrated the facts and take it from the beginning and simulate the plant conditions and chemicals.

Really on that head loss that's all we have. This is basically to fill the background.

MEMBER FORD: Can you go back -- the graph. Well, first of all, what the species? It's

not metallic.

MR. JAIN: It's metallic. It's a salt. Metallic salts were added to the solution and precipitants were forced to be formed.

MEMBER FORD: So it's zinc hydroxide or -- I'm trying to work out physically what -- the thing I'm looking at, the diamonds for instance, are peaking. Why would they peak physically or is that --

MR. JAIN: Well, it's aluminum. I mean, really the purpose of --

MEMBER FORD: aluminum flakes, you mean powder?

MR. JAIN: Powder.

MR. LETELLIER: They were metallic salts.

MR. JAIN: Metallic salts.

MR. LETELLIER: And they were dissolved in high concentration and then introduced into the loop in excess of their saturation.

MEMBER FORD: In excess -- okay.

MR. LETELLIER: We forced the precipitation to occur.

MEMBER FORD: Okay.

MR. LETELLIER: That's the key, that we did force it.

MEMBER FORD: And the scale there is what?

One, 2, 3, the vertical steel, the head loss in feet or time?

MR. LETELLIER: Five, 10, 15, 20.

MEMBER FORD: Five, 10, 15, 20.

MR. HSIA: The test was run in a small loop at LANL. And you got your head --

MEMBER FORD: The fibrous stuff that you presented --

MR. HSIA: Right. The fiber bed there and put metallic salt in the system and see where it goes.

MR. JAIN: Last year, March.

MEMBER FORD: So as of last March you knew that there was a kind of a potential?

MR. JAIN: Well, we knew that if the gelatinous material is formed and is transported to the screen there could be substantial head loss.

MEMBER FORD: Right. Okay.

MR. JAIN: In order to find whether there will be a gelatinous material formed after that integrated tests come into play.

MEMBER FORD: Right. Okay.

CHAIR WALLIS: But it is highly unlikely that all that water is going to be saturated with any aluminum, iron or zinc salts, isn't it?

MR. LETELLIER: Some of the information we

presented previously showed how insoluble some of those metals are. On the order of between 20 to 25 to 45 pounds of some of these metals in a million gallons of water would be sufficient to exceed saturation. So the complimentary question is do you have corrosion mechanisms that can contribute that much over the course of the accident sequence?

MEMBER FORD: And this is pH 7?

MR. LETELLIER: Right.

MEMBER FORD: Temperature is room temperature?

MR. LETELLIER: Room temperature.

MEMBER FORD: Okay.

CHAIR WALLIS: And I think the last time we talked about this you said you need tests on the more realistic --

MR. LETELLIER: Yes.

MR. JAIN: We plan test plan for integrate tests that presents more LOCA environment. So with that, I'll have Tony go over our integrated test program.

CHAIR WALLIS: These are the only results that you have so far?

MR. JAIN: Well, that's what the purpose of the program was to real head loss effect. That

family, that's what we studied.

CHAIR WALLIS: Those are the only results you have so far?

MR. HSIA: No. That diagram is not the only results.

MR. JAIN: No. No. That is just a typical sample.

CHAIR WALLIS: It's typical of the results you have to far?

MR. HSIA: Yes.

MR. JAIN: Yes. The report has several others.

CHAIR WALLIS: But there's no conclusion we can reach about the real situation yet?

MR. JAIN: Well, the only conclusion you can reach that if these precipitants are formed your head loss potentially could be larger than what you would get from the fiber debris.

MEMBER FORD: Isn't that a function of the salts you use, it could be a function of the mesh size?

MR. JAIN: That's right.

CHAIR WALLIS: Or etcetera, etcetera?

MR. JAIN: Right.

MEMBER FORD: Right.

MR. HSIA: We're very -- or at least I am I should say, very excited about working on GSI-191 issue, particularly the ICET test. When I mentioned that to one of my supervisors, the person "You're a sick man." But I really felt we have good colleagues here with NRR and our staff and LANL, so I think --

MEMBER FORD: It is like cracking like people, they always think a crack is good.

MR. HSIA: Yes. You know, I really felt excited to get involved in this project.

The first bullet says the purpose of the ICET project is to determine and characterize the chemical products, including possible gelatinous material in a representative post-LOCA condition.

We keep emphasizing we want realistically conservative tests. We are not trying to duplicate TMI. We're not trying to force formation of any corrosion product or gelatinous material. I think throughout the whole series of tests and studies we're performing on this particular issue we need to be consistent. Because if we go to the, let's say, international tests and they got to be overly conservative in certain areas, then they just don't match. And then later on we have some data we have to explain and say "Well, we really didn't mean to do

that, and that's overly conservative." And really the Commission has told us a number of times make sure you're realistically conservative. So we're very aware of that. We don't want to be over conservative in doing analyses as well as doing experiments. And that's a key consideration for this project.

And this is definitely a cooperative research project between industry and us. We have developed an addendum to the existing MOU between EPRI and the NRC so we can go and do this. Industry has been influential to providing us information and let alone funding, parts of the funding. NRR staff and MNSS staff has been very helpful. Al Santos I would like to mention. He's unable to be here, he's on business travel. He's very instrumental to this project working with the Southwest Research Institute to do the first phase of this ICET project.

NRR staff has provided us with valuable information and input on all phases of this project.

MEMBER FORD: Now you say this is the first stage. You'll define the various stages?

MR. HSIA: Yes. Yes. And this is going to be scaled tests. I will get into that a little more. Obviously, it's a smaller test facility as compared to the real thing and the realistic condition. And we're

very aware of the timeliness. We're trying to support the generic issues and the timing that's necessary to be able to include the data from this test as part of the generic letter response and generic letter can do justice as far as how the industry will address the chemical issue.

And industry involvement is very important because we need data. We actually did surveys, that's how we developed the test plan.

This is the different elements of the ICET project. The first phase is what I call the thermodynamic simulation of the LOCA containment environment. That's done by our contract Center for Nuclear Waste Regulatory Analysis. And I'm sometimes going to change that with the Southwest Research. It's the same facility. And the project is Al Santos, MNSS.

The test plan development and contractor selector is NRR and us and EPRI. We've gone through quite a bit of rigorous consideration. We actually sit down with different factors. We rated different potential contractor, and finally we selected LANL based on their capability and their knowledge and they were able to provide timely results. As well as another important factor for this whole project is the

QA.

The project will meet the intent of Appendix B because some of it, if we go ahead and do -- if the gelatinous material is developed, we'll then focus our attention on the head loss. And some of those head loss data may be used by industry to be part of their solution of the GSI-191 issue. So we want to make sure QA from the get-go, from the test plan development, from the test facility design, data and documentation is all Appendix B intent.

NUREG/CR at the end, our goal is to develop a NUREG/CR to document the research and the results. So phase one is the thermodynamic simulation.

The objectives. It's a very complicated issue. We really don't know, there are a lot of questions what kind of facility we should have, what kind of test parameters we should have. So this program is called -- at the last bullet, I'm doing it backwards. The last bullet says computer code OLI. It's a thermodynamics program with a huge database. It's pseudo-steady state chemical equilibrium program. You dump all the chemicals in there, it will provide to you the results. All the species, all the chemical reactions, what you will have in that soup. And this

program, you may have hard other programs such as -- the European uses J -- anyway, I can't remember the name.

There's another program Europeans are using called FREEKS. It's similar to this. It's all pseudo-equilibrium program. And this one has the most extensive database, so we choose that one. And it's been validated to a certain extent.

MEMBER KRESS: What do you mean by pseudo-state?

MR. HSIA: Yes.

MEMBER KRESS: You're going to hold it at a steady state even though there's a transient in the real thing, you're going to look --

MR. HSIA: Yes.

MEMBER KRESS: -- at steady state points along that --

MR. HSIA: Correct. Correct.

JCHESS is the program that Europeans are using. Thank you.

MEMBER KRESS: All condensed phase to equilibrium and solution?

MR. HSIA: Yes. Yes.

MEMBER FORD: So bearing in mind that these occur, these events in the real situation will

occur quite rapidly, why are you basing your criterias as to what exist on thermodynamic criteria? You're really blasting two phase stream of steam and water at paint or whatever contains the metal. And you're using thermodynamic simulation criteria to determine what's going to happen in a --

MR. HSIA: Well, let me clarify that. This program is not a RELAP type of program. It's really we're looking at what we call the soup, what's in the containment sump.

MEMBER FORD: Yes.

MR. HSIA: Or that body of water, what's in there.

MEMBER FORD: Yes.

MR. HSIA: Given the spray and given the metal, given all the chemicals that realistically existed. So we're not --

MEMBER RANSOM: -- reactions to it -- I don't think there are any transient models for such things.

MR. HSIA: Yes, we are not aware, we couldn't find any. So we decided this is the next best thing to it.

MR. YANG: (Off microphone)

MEMBER RANSOM: Okay. That would be

conservative.

MR. HSIA: Okay. I just want to say one more thing. On the second bullet, the reason we did this series of analysis is to really provide insights on the effect of the very parameters. How sensitive is pH? How sensitive is the pressure? How sensitive is the temperature and so on. Because the big question in the beginning was now do we need a pressurized loop now because it goes from 2200 degrees psi to 600 degrees and comes down to a much lower temperature and pressure. Do we need that? We'll see this. That's part of the reason.

A little background on OLI. It's being used widely by the industry and other agencies for mostly aqueous chemical predictions. So it's more of a chemical tool. It's a thermodynamic equilibrium, but it's not a thermalhydaulrics tool. And it has a good range of applicability. As you can see the ionic strength, which is really a concentration of zero to 30 molal and temperature range from minus 50 degree to 300 degree centigrade; that's way, way larger than what we need to do. Because we're focusing around 60 degree centigrade as a long term temperature in the containment sump. And pressure covers a lot of range. So that's a good code.

And it's been validated by comparing results with experimental data. That's what I mentioned earlier, is that these data are from '60s. There are plenty of them that we thought would be nice if we can have a 21st century data on some of the corrosion rate and insulation material. So right now Center is validating the code for borated water.

And this is a simple description of the model. Let's say you have one liter of solution of certain boron concentration and sodium hydroxide, pH 10. You can dump the concrete -- there's a chemical formation of the concrete dust, zinc and so on. It's listed here. And also we can dump the Nukon fiberglass and find out what kind of leaching rates and corrosion rates are being generated from this program. That gives really an insight as to how these things react together.

And here's a sample result, as you can see, that helps us to decide whether we need to do a pressurized system, to have pressurized test facility or not. If you look at cooper, you know from 150 degrees centigrade to 60 degrees and you look across the chart, they're pretty constant, you know between 60 degrees and 130 degrees. So this helps us to decide we don't need a pressurized test loop. So what we have

is a loop open to the atmosphere. It's covered, open to the atmosphere but we are aware of the possibility of the hydrogen generation when you dump all kinds of chemicals in there. However, the loop we don't need pressurized. And the high temperature from 150 or above to 60 degrees, we don't need to keep that facility at that temperature. But for our test coupons we're going to do preconditioning just to make sure those test coupons will experience those high temperature and pressure and see what kind of reaction they have.

So this diagram help us to conclude that we can use a nonpressurized facility.

This diagram shows the sensitivity of different species at two different temperatures and two different times. What this one shows to me, if you go to the darker higher bar, is when you go to a lower temperature most of these chemicals the leaching rates increase at a lower temperature even for a much longer time. If you look at it, that's 14 days versus half an hour at a lower environment. What that means is when you expose these things to this environment or condition, you're not generating additional chemical species. All you're doing is generating more. So that's good news to us. That simplifies the matter a

little bit so we don't have to be concerned with time and you have new product that's being generated.

MEMBER FORD: Well, its vertical axis is what? Moles? The vertical axis is moles?

MR. HSIA: Oh, the vertical. Is that moles, Dr. Jain? The vertical axis.

MR. JAIN: The question?

MR. HSIA: The vertical axis?

MR. JAIN: It's molal.

MR. HSIA: It's molal. Okay.

MR. JAIN: It's molal per kilogram of water.

MR. HSIA: It's mole per kilogram of water.

MEMBER FORD: Okay.

MR. HSIA: And there are quite a more, I'm just presenting a few represented results.

The conclusions from the analysis so far, there's no need for pressurized facility. And we also found out from the series of analysis the concrete and the insulation leaching are major contributor to the soluble product.

Early on when we started doing this as early as late last year, we were focusing on corrosion product.

MEMBER FORD: I am sorry. There's so much information I'm trying to understand what it's telling me. Can you go back one, please?

MR. HSIA: Yes.

MEMBER FORD: Why are you saying that there is no need to go to a pressurized facility.

MR. HSIA: Oh, that's even earlier.

MEMBER FORD: I'm sorry. This one.

MR. HSIA: Oh, you wanted that one? That one didn't take me to the conclusion that we don't pressurized facility. The previous one that takes us to the conclusion. Because you know at 60 degrees -- if you go at 150 degrees, you know you got to have a pressurized facility.

MEMBER FORD: Right.

MR. HSIA: Otherwise it's above boiling. So all I'm saying is looking at cooper, look at the sodium, aluminum silicate and other silicates, that's almost like a formation of -- zinc, FERROUS and zinc silicate. For different temperature between 60 and 130, 150 centigrade, they pretty much stay constant.

MEMBER FORD: Okay.

MR. HSIA: So we're saying we don't need to go to pressurized facility.

MEMBER FORD: Okay.

MR. CARUSO: Because all these chemical species have reverse solubility?

MR. HSIA: Not all, some of them.

MEMBER FORD: Well, the effective pressure, if there is a change in specific volume with the reaction, then the pressure will favor the smaller specific volume state. I don't know. These may represent essentially negligible changes in specific volume with the reaction. If that's the case, pressure is not important.

MR. HSIA: I don't know that the number of specific volumes. By this, you know, there are other results that demonstrate that they pretty much stay constant, the concentration for different species stay more or less constant. In other words, the change is not very large. If you look at the scale, it is 10 to the minus 5 and 10 to the minus 6. That's why we came to that conclusion.

CHAIR WALLIS: Well we can come to the conclusions about pressure based on the conclusions about temperature.

MR. LETELLIER: No. There were actually parameter studies done on the effects of pressure as well.

MEMBER FORD: Usually pressure is more

important for like a gaseous component of the reaction. Nothing is compressible here or significantly compressible. The water is essentially--

MR. HSIA: Yes, these are all in the water, in the soup.

CHAIR WALLIS: These are all reactions that might occur in the sump and not reactions that might occur on the walls of the containment?

MR. HSIA: Yes. These are all of the components. We have sodium in there, we have cooper the source of containment air coolers and a few other things. And zinc certainly is there in the paint.

CHAIR WALLIS: So these are all a gauge of 10 which is the facility?

MR. HSIA: Yes.

CHAIR WALLIS: When the stuff is on the wall of the containment it's --

MR. HSIA: During the test we'll have the spray simulated, but we believe that effect is not going to be significant because the time at most, you got a few hours of spray in reality. And whatever chemical, those chemicals or those metals then comes down into the sump.

CHAIR WALLIS: It is much hotter up there.

MEMBER FORD: Okay. You've presumably gone through a physical sequence thinking as to where these things come from. The zinc oxide comes from literally the paint.

MR. HSIA: Yes.

MEMBER FORD: And that would be just because of streaming of water down the walls of the containment?

MR. HSIA: The containment.

MEMBER FORD: Whereas the --

MR. HSIA: The zinc is also is in the galvanized steel and --

MEMBER FORD: And the insulation, the silicates, that would be both in the sump water as well as the blasted by the jet --

MR. HSIA: Yes.

MEMBER FORD: See, all of these things, the various mass transport controlled things.

MR. HSIA: Yes.

MEMBER FORD: In this beaker experiment, those aren't --

MR. HSIA: These are analysis. These are not even beaker.

MEMBER FORD: Those are all analyses?

MR. HSIA: Yes.

MEMBER FORD: Okay.

MR. HSIA: These are not in experiment.

Later on you will see, at least I certainly should explain, when we do the test matrix we have certain percentage of submerged metals and insulation, a certain percentage of nonsubmerged.

We did plant surveys with the help of the industry. So we have a pretty good idea of how much of certain item is submerged or nonsubmerged. And we used that ratio to scale it.

MEMBER FORD: Okay.

CHAIR WALLIS: What is all the latent debris, which is lying around?

MR. HSIA: Latent debris would be part of the concrete, species associated with concrete. And the other plastic latent debris we did not take that into consideration. And cloth, I don't know what kind of cloth we have.

So latent debris we did not take into consideration as far as test coupons.

CHAIR WALLIS: Well, do you have any idea of the composition of the latent debris in the containment?

MR. HSIA: Maybe Bruce. He will --

CHAIR WALLIS: He'll talk about that?

MR. HSIA: Yes.

MEMBER RANSOM: Are these insulations that we saw yesterday treated with any, what do you call it, binders?

MR. HSIA: Binders. Yes. The insulation are treated with binders --

MEMBER RANSOM: So are they like polymers?

MR. HSIA: Industry will provide us with those coupons. First that's pre-aged so instead of brand new, it's going to be 15 and 20 years.

MEMBER RANSOM: Are those chemicals representative of what you would leach from those insulations.

MR. HSIA: When we do the tests we'll take the real thing and do that. On these analyses we just take the count down of the insulation fiberglass material. We did not --

MEMBER RANSOM: Not of the hydrocarbons or whatever is binding them together?

MR. HSIA: No.

MEMBER KRESS: Is aged material necessarily worse?

MR. HSIA: I don't know. Maybe the industry insulation expert can tell. Yes, John?

MR. GISLON: John Gislon from EPRI.

You'll probably see it someplace, too, but the fiberglass comes with a phenylic resin binder in it. And to simulate service on a hot pipe in a system it'll be basically baked on a large hotplate for a sufficient period of time to simulate service. And that phenylic resin, part of it will have been driven off, part of it will be retained in the insulation that's used in the test.

MEMBER RANSOM: It's phenyl, so what phenyl hydrocarbon type compounds.

PARTICIPANT: (Off microphone).

MEMBER RANSOM: Yes. Any suspension that they may be in that in significant factors?

MR. GISLON: We don't really know, but definitely insulation material has been on a vessel will have to be composed in some extent, there will be composition. And so given the capability of even the hotplates, we will have simulated that. So I believe that we can do it that way.

MR. HSIA: Yes, Bruce.

MR. LETELLIER: Additional comment. This is Bruce Letellier.

I think there's a perception that the resin binders protect the fiberglass from dissolution and so by removing it, you give a better opportunity

for leaching into the pool. That's one rationale for pre-aging.

MEMBER RANSOM: But you also ruin the phenylics that might end up interacting as well.

PARTICIPANT: We won't have gotten off all the binder. Our intent was the testing is to use the hotplate such that the insulation that ends up in the test vessel will be similar to what you'd have the plant where the layers closest to the hotplate in the plant, the resin would have been driven with the -- that remain below the temperature in the plant where they won't be driven off, would also go into the test plant and into the test solution.

MR. HSIA: As you can see, we're trying to introduce as little artificiality as possible. We're trying to do the realistic situation.

CHAIR WALLIS: What about the initial chemistry of a hot borated water coming at very high velocity and impinging on stuff? Doesn't that did to produce rapid rates of chemical reaction simply because of the high velocities and the high temperatures?

MR. HSIA: Usually the high temperatures, as far as solubility, would help in corrosion. But for high temperature and the lower pH. But for insulation

material as certain other material, it's just a --

CHAIR WALLIS: It's not an attempt to simulate what happens in the sort of blowdown region where you're --

MR. HSIA: No. In this analysis we're not trying to simulate a blowdown region.

CHAIR WALLIS: But that produced, presumably, soluble stuff?

MR. HSIA: We feel that's a smaller crack than a longer --

CHAIR WALLIS: You feel?

MR. HSIA: Yes.

CHAIR WALLIS: Well, I don't feel anything. You got to calculate or estimate or something. There's on feelings whatever about this.

MR. HSIA: Okay. Let me take it back. I don't feel nothing.

CHAIR WALLIS: Good.

MR. HSIA: But in our judgment when we're trying to do this --

CHAIR WALLIS: So you made some calculations which convinced you that what happens up there is unimportant and --

MR. HSIA: It's judgment. It's based on some of the analyses seen here. We didn't see a

sensitivity to higher temperature and pressure. And also based on judgment combined with the analyses result we felt the majority of what's happening longer term is going to be after the initial blowdown. And we're focusing on recirculation.

MEMBER RANSOM: I would guess the most important thing that happens in blowdown is the shredding of the material and the intimate contact and all that produces so that you can leach out the stuff as it flows down to the sump?

MR. HSIA: And relatively speaking that's a short term.

CHAIR WALLIS: But if it's rapid --

MR. HSIA: I understand.

CHAIR WALLIS: Rapid reaction, then you'd still be in trouble.

MEMBER RANSOM: The high temperature, right.

CHAIR WALLIS: I have no idea what happens when you take these high temperature, high pressure jets and impinge them on, say, a zinc protein of some sort.

MR. HSIA: Tim?

MR. ANDREYCHEK: Tim Andreychek, Westinghouse.

The jet condition is relatively local to where the break is at. And this is generally somewhat confined, depending upon the structure, the containment, it's inside the bioshield refrain wall, that's where the jets aiming typically with inside those areas. But the structures are limited to the steam generators, the primary piping, also the support structures for the -- steam generators. Much of what you see in terms of galvanized material is located outside the bioshield and it's in peripheral areas of the containment. You don't get the high energy jet impingement that you're speaking of on those components.

CHAIR WALLIS: Okay. So the impinge is on things which are unlikely to react with the jets?

MR. ANDREYCHEK: That's correct, sir.

CHAIR WALLIS: All right.

MR. HSIA: Okay. I'm back on the conclusion viewgraphs.

So right now in addition to the corrosion product, we're more sensitive to the concrete insulation region that may contribute to generation of gelatinous material.

Cooper is not sensitive to pressure and temperature effects.

And then the silicates that are formed greater amounts and lower temperatures, that brought up our sensitivity. Those sodium aluminum silicate and sodium silicate we need to watch out for those things.

Uncertainties. Glass wool, its leaching rate in the borated alkaline water. That's why I mentioned earlier that we would like to recommend to our management instead of taking the glass log data used in the analysis, we would like to take some real current insulation and do leaching rates.

Velocity on leaching rates. Again, based on the analysis we saw, as we can all realize if I'm making gelatin, if I keep stirring the thing it's not going to formed. But once I let it sit there and put in the refrigerator, drop the temperature it forms. A similar type of effect here. So at a low velocity if it's a quiescent region, the glass will maybe be worse actor than other case. However, the saving graces in the quiescent region somewhere in the containment, hopefully it doesn't move even if it forms a gel. So that's another uncertainty we have.

Corrosion rates, that's the last bullet, I already mentioned. We have some old -- I'm not saying they're not valid, but it's just older data as

far as corrosion rates.

MR. CARUSO: Have you considered galvanic corrosion?

MR. HSIA: Galvanic corrosion was -- yes, it is considered.

MR. CARUSO: You have coupled materials attached to one other electrically sitting in the boron water?

MR. HSIA: Well, we couldn't space it. Paul is raising his hand. Paul, go ahead.

MR. FINE: Paul Fine from NRR.

We made a decision not to try to couple the species for several reasons. About 90 percent of the test tube roughly are going to be above the submergence line. So we didn't think that galvanic corrosion of those of those would be of the same concern. And for the ones that are submerged, I guess we didn't convince ourselves that coupling them would provide more realistic results then leaving them uncoupled because if you couple, you may end by highly positioning the samples or having different effects that may or may not be realistic compared to plant conditions. Plus, it would be difficult to predict on a plant specific basis how to couple the samples and which type of materials to place adjacent to each

other. And then we also have your test vessel in this case is a stainless steel tank, not a concrete containment vessel. So if you coupled the whole thing in addition to your test vessel, you might also introduce some unanticipated consequences.

MR. CARUSO: So shouldn't that be listed as another uncertainty?

MR. FINE: I believe it's --

MR. HSIA: Well, Ralph, you're mentioning the test uncertainties. These are the modeling uncertainties I'm still focusing on.

MR. CARUSO: Is that another modeling uncertainty?

MR. HSIA: A model uncertainty.

MR. CARUSO: Another model uncertainty?

MEMBER KRESS: You could model that at this kind of code.

MR. CARUSO: See, I don't know --

MEMBER KRESS: Yes. You can put in the ionic species and do the thermodynamic equilibrium of those.

MR. ANDREYCHEK: The galvanic reactions from our experience tend to be relatively slower compared to the chemical corrosion activities that we're seeing. And over the time period of the test

it's our evaluation that they're going to be relatively minor contributors to the other corrosion products that you expect to see.

MEMBER KRESS: You couldn't do that because that's a dynamic.

MR. ANDREYCHEK: The chemical corrosion effects, those are the dominate players and therefore that's what we're looking at and why we've chosen not to focus on galvanic corrosion.

MEMBER FORD: Tony, could I just make sure I understand what has been done and what has not been done so far? Apart from the tests that BP reviewed which we heard earlier in the spring of last year that was done at LANL, you've done all the thermodynamic tests, the calculations --

MR. HSIA: Yes.

MEMBER FORD: And have shown that provided you're are at 130 degrees centigrade, many of the expected salts would be precipitant at around about 10 to the minus 6 molal. Now it's very likely that they would be precipitant. We don't know the form of the precipitant, whether it's gel or crystals or whatever. And that is all we have accomplished in that year?

MR. HSIA: Correct.

MEMBER FORD: And that between now and I

think you said August of this year --

MR. HSIA: August.

MEMBER FORD: -- that's 3 months or 4 months you're going to do the ICET or whatever the acronym is, to look at these effects of velocity, temperature and things of this nature and relate to blocking of a certain variable number of screen sizes. Is that correct?

MR. HSIA: Correct.

MEMBER FORD: Okay.

MR. HSIA: I'm not sure how much we'll get out of the velocity, but the formation of all this corrosion products and possibly gel we need to find out.

MEMBER FORD: And that are going to go into the test matrix for this ICET.

MR. HSIA: Right.

MEMBER FORD: Okay. Good. Because quite honestly, I'm not at all sure what thermodynamic criteria it's just telling you what might form. It doesn't tell you it will form, of course.

MR. HSIA: Correct. That's why we said it might give us an idea.

CHAIR WALLIS: I would think the rate of the reaction is far more important.

MEMBER FORD: And you've only got 3 months to do it in.

CHAIR WALLIS: Right.

MEMBER FORD: Okay.

MR. HSIA: The test plan development. First, we start with industry survey of plants because we need to know what we're going to test, what volume, what temperature, what species, what metal. Total surface area of each material, each material meaning each candidate; cooper, zinc, steel and so on.

And percent, what percent is submerged, what percent is not submerged, surface area after LOCA. That means I'm not talking about the blowdown phase, I'm talking about the steady state or more or less in the recirculation phase. How much surface that is exposed, meaning not in underneath the sump water volume. And how much volume is there in the sump water. And the ration of the -- we started out the ratio of the surface area of each coupon material to the sump water volume. Okay. That's the key scaling factor we're using. And I listed material.

CHAIR WALLIS: These submerged areas, these are intact materials or shattered materials or some sort of --

MR. HSIA: Both. We have some insulation

material, obviously, shattered. Maybe some paint chips that's shattered. The rest we're talking about just metal. Scaffolding material, surface area in the containment and so on.

MEMBER RANSOM: Are any of these materials fine enough that you form a thixotropic mixture with the water?

MR. HSIA: I don't even know how to answer. Isotropic mixture?

MEMBER RANSOM: Thixotropic. Fine particles in medium like water will form a gel which is plain water. It sheers differently. I mean, under sheer it will flow like water but under stationary conditions it's like a gel.

MR. LETELLIER: That would be very high concentration of the particulate.

MEMBER RANSOM: No, very small concentrations of particulate will form a gel of that type. You use it in your hair lotions or your shampoos. I mean, most of these are thixotropic mixtures. And they look like gel.

I almost wonder, are some of these gels that have been experienced, are they really a result of chemical reactions or are they result of particulate matter?

MR. HSIA: I don't know. Go ahead. Bruce, you have to answer to that.

MR. LETELLIER: Bruce Letellier, Los Alamos.

Our understanding is that the gels that we've observed by artificially inducing those reactions are hydrated precipitation products.

MEMBER RANSOM: You know that from analysis?

MR. LETELLIER: We look at SEM photos of the residual on the fiber substrate and they tend to retain some of the shape of their hydrated form. They're much larger than the particles you mention. That lends some credibility to the idea that it's based on a hydrated gel.

And also some of these reaction products, as I'm sure, can be substantiated. They're know to be gel forming agents from the metallic corrosion products.

Quite frankly, we haven't looked at the thixotropic mixture.

MEMBER RANSOM: You might to, because even dust and things like that that are available in the containment may form that kind of mixture.

MR. LETELLIER: I would have to say that

we have studied prototypical containment environments. We've done latent degree characterization and -- washing processes. We've never observed that kind of formation.

CHAIR WALLIS: Did you try putting containment dust in the alkaline solution?

MR. HSIA: For this test, no. We have not put any containment dust in solution.

Let me go to the second bullet of this viewgraph, that's the test loop design and coupon based on the following.

From some of the observations and experiments that we -- in this case we learned from the international workshop 3 to 5 centimeter per second. I think yesterday somebody mentioned that, too. That seems like the approach velocity to the screen. So we used that.

And the 250 gallons, we just come up that water volume that we think if it's too large, you need too many surface areas, too many coupons. It was too small, it won't fit. So there's a balance that we just picked 250 gallons of test loop water volume as our base point to start.

Then based on the surface area to water, sump pool water volume ratio we know how many coupons

we need to have for certain material. And the coupon currently is 12 inch by 12 inch each. I think the thickness was 1/8th inch thickness. 1/16th. I'm sorry. 1/16th inch thickness. And we can calculate how many coupons we need.

CHAIR WALLIS: I would suspect nothing is going to happen.

MR. HSIA: I beg your pardon?

CHAIR WALLIS: I'm saying I suspect nothing is going to happen.

MR. HSIA: Well, that's wonderful news, and everybody can go home.

CHAIR WALLIS: No. I mean, you haven't given me any evidence that suggests anything is really going to happen. You've given no reaction rates and it seems a fairly mild solution and you're going to put stuff like cooper and zinc in there; is it really going to dissolve at any significant rate?

MR. HSIA: No. We're not just dipping it there. We leave it there for, the first test, 30 days. Thirty days. And then subsequent tests we're going to--

CHAIR WALLIS: But you have no idea of the rates of reaction?

MR. HSIA: We have some idea of the rates

of reaction, but that's -- we're not considering that to determine the length of the experiments because we think we want to be on the safe side, we want to capture as much as we can. So we put 30 days in the soup, all those test coupons in the soup. That's the first test and we don't intend to do 30 days per test. Later on we hope we can reach a equilibrium much sooner, maybe hopefully a week. But we're open on that. We're not saying we have to cut off. But we would certainly like to do a shorter test, otherwise it goes on forever.

With the pH, although it's a lower temperature, we believe you will see some reaction. And I think partly that was born from LANL tests even for the induced, you see some reaction at a lower temperature.

CHAIR WALLIS: So they have done the simple quick test of putting these materials in a bath of this solution, seeing if anything happens. That's being done, right.

MR. HSIA: But that's induced. That's before something happens. The focus on those tests was to see the head loss. And here, you know, we're stepping back so let's see if it does happen.

CHAIR WALLIS: So they put coupons in and

they saw that they actually corroded.

MR. LETELLIER: Yes. That was a complementary aspect to that test.

CHAIR WALLIS: Yes. Because if you put the coupons in, you put coupons in tomorrow and you can see if they corrode. And in absolutely nothing happens in a month, then you sort of wonder why you're doing this test. You did see things happen?

MR. LETELLIER: Yes, we did. One of the deficiencies was those corrosion tests were done in a quiescent beaker where we had no mass transport away from the surface.

CHAIR WALLIS: Right.

MR. LETELLIER: And that's the intent of having a --

CHAIR WALLIS: Which might increase the rate presumably.

MR. LETELLIER: Yes. Correct.

MR. HSIA: John?

MR. CAVALLA: This is John Cavalla.

Looking at the zinc paint that's going to be used in the test, it's actually small, about a 20 micron balls of zinc and at least 80 percent of the dried film was in an ethyl silicate or glass binder.

From history we know that zinc is an

aciduric metal when the pH goes below 4, the corrosion rate goes off the chart. So we have had in industry in general, not just nuclear, catastrophic problems with exposing zinc to both quiescent and following acidic fluids and the rate of corrosion is horrendous. So with the tests that is being composed as detailed, we anticipate a very rapid corrosion rate of particularly the immersed zinc, and even --

CHAIR WALLIS: But this a high pH on there.

MR. CAVALLA: The corrosion rates are very high with pH of over 10 or below 4.

CHAIR WALLIS: On both extremes?

MR. CAVALLA: Both extremes. It's a U shaped curve.

MR. HSIA: And we're testing pH now, we do it both 7 and 10.

CHAIR WALLIS: What's the pH of the primer system water, you know with the boron in it?

MR. HSIA: Normally about 7.

CHAIR WALLIS: It's about 7 even with the boric acid in it?

MR. HSIA: Yes.

CHAIR WALLIS: So it's like normal water? so the boric acid has no effect except when it dries

out on something, it gets concentrated?

MR. HSIA: We're going into this pretty open minded. We're not assuming what's going to happen. We'll see whatever falls out, the result is what we got.

John?

MR. GISLON: John Gislon again.

There are other effects there like temperature and also the normal operating reactor, chances occurs you do insert lithium hydroxide.

CHAIR WALLIS: That's what produces a pH of 7.

MS. GISLON: -- phosphate is used as a buffer for this post LOCA scrubbing of radio-iodines from the containment atmosphere, as is the sodium hydroxide. It's purpose is identical.

MR. HSIA: Yes, Ted?

MR. ANDREYCHEK: One other thing to address corrosion rates. There was early test data done by Oak Ridge and others to look at corrosion rates of zinc and of aluminum specifically for the purpose of hydrogen generation. That goes back into the '60 and the '70s. And no one has done, to the best of our knowledge, an integrated test where we're looking at putting all of these corrosion sources

together in one test and looking at what they do in a combined integrated test. Hence, the name integrated test that Tony keeps referring to, in some cases we believe that there might some compensatory type things that occur. We're going to be self-limiting to what we would put on the solution based on what else is going on there with regards to the aluminum and zinc sulphate. The purpose of the test is to find out what goes on. We're not sure, and that's why we're running the test.

MEMBER FORD: One of the questions that came up in the ACRS letter in September was this question of the conjoint, not only dissolution of the zinc, but also the creation of the hydrogen and therefore the effect of the buoyancy of the paint chips. Will that predict that, the effect of hydrogen bubbles on the zinc oxide --

MR. HSIA: We're aware of that. We have already with LANL that we need to watch it. But we're not making a special effort to calculate, to evaluate the hydrogen generation.

Mark?

MR. MURPHY: Mark Murphy from NRR.

These are not actual paint chips. This is going to be an inorganic zinc coating applie to a

substrate. So unless the coating debonds during the test, which is shouldn't because it's a qualified coating. It's been tested to show adherence in the DBA, we won't have the ability to see what --

MEMBER FORD: I seem to remember the EDF, the vacuuming. You mentioned that when you were vacuuming the containment building some of the paint came off. Did I hear you correctly?

MR. BLOMART: Yes. Yes.

MEMBER FORD: And therefore, after a time, the paint does degrade and therefore could well just flake off and therefore you're corroding zinc plates or zinc chromate --

MR. BLOMART: Well, you're talking about current experience or --

MEMBER FORD: You were talking about when you're doing your latent debris --

MR. BLOMART: Oh, yes.

MEMBER FORD: -- experiment and you used a vacuum cleaner.

MR. BLOMART: Yes.

MEMBER FORD: And you were able to vacuum off paint.

MR. BLOMART: The experiments were to know exactly with what you know about rates of debris and

the wear on the walls and so on. We find a percentage of 50 percent of fibers. We didn't find any debris in this one. The coatings we have on our plants is a qualified coating and it is subject to maintenance --

MEMBER FORD: It always worries me when people say a qualified coating and then done it. About ten years later we have these coatings coming off or cracks appearing in the pressure vessel, or whatever it might be. And that wasn't -- that was all qualified.

MR. BLOMART: The effect of pH is somewhat --

MEMBER FORD: Yes.

MR. BLOMART: That's clear. That's why we say we must continually replace the coatings.

CHAIR WALLIS: Wait a minute. Are we about half way through here. I can't figure out is this all your presentation I have here or is it somebody else's?

MR. HSIA: No, you won't have me here too long. I'll try to wrap this real quick.

CHAIR WALLIS: I was just wondering, is this -- we have here 30 something slides. Are they all your presentation or are they somebody else's?

MR. HSIA: No. I don't have that lecture.

I'll go and I'll be back.

CHAIR WALLIS: Okay. Because I thought we might be running out of time. Apparently time.

MR. HSIA: John?

MR. CAVALLA: People don't like to hear too much about paint.

Going back to your question and also an earlier question, inorganic zinc primer coating was very unique in that you don't have the high resin concentration in our other coatings, like the epoxy. The inorganic zinc exhibits very poor cohesive strength. So when it fails, it fails typically by corrosion and/or spawning very tiny particles, you know, in the 10 to 20 micron range.

Now going back to the question earlier about the flocculent oxides that are formed. What we see and is taught by the BWR Mark 1 experience, many, many -- the suppression pools in Mark 1s are coating with untopped coating inorganic zinc that contain an essentially neutral pH fluid. What we see over time is a launch down of floc of zinc oxide and zinc hydroxide corrosion products which form a floating film, very very small, very thin film on the surface of the porous water. And unless disturbed a turbine trip or blowdown, what have you, you can see this on

there. And it's not a large amount, but in fact does form that precipitant that precipitant that you asked about.

But inorganic zinc doesn't chip. It just can't because it has such a core cohesive strength properties that it will come off and it's pigment size particles. You don't get anything that looks like chip.

CHAIR WALLIS: But then it's more likely to react if it's in very small particle size?

MR. CAVALLA: Absolutely. It's a particle of zinc that reacts and quickly forms zinc hydroxide and zinc oxides and then --

CHAIR WALLIS: And when it forms zinc oxide it release hydrogen?

MR. CAVALLA: Yes, sir.

CHAIR WALLIS: Which could make these bubbles we were talking about or make things boil?

MR. HSIA: This viewgraph will give you quick view of this test facility. It's really a tank 4 feet by 4 feet by 6 feet tall with a funnel down the bottom and this is made out of --

CHAIR WALLIS: In other words, a perfect of tank you could possibly design?

MR. HSIA: Right. But we add port holes

on ours so we can look inside. We not only want to test and get data, we want to see what's going on.

This is a schematic of the test loop. Actually we were thinking maybe we have, as you can see, we have certain coupons hanging submerged. Other coupons are not submerged. And we can take samples, collections stop right there. We have pumps that feed the whole program that we can also drain to waste tank and measure delta p.

This is designed so in case we have to go to a delta p measurement for pressure drop across the screen, we can do that later on. But this moment what we do is we have all the coupons hanging including the insulation material. It's almost if you will think of the McDonald's French fry basket. It's a basket that will hold the insulation material and let the flow go through and see if it collects. If it collect, if it formed gel and so be it. And we'll have that in the inlet and the outlet areas as well in the quiescent area for insulation. So that's the schematic.

Here gives you a little bit more detail on the design features.

CHAIR WALLIS: This cubicle tank is all of a sudden a trapezoidal one? Not that it matters, but--

MR. HSIA: It's the same one.

CHAIR WALLIS: The same thing?

MR. HSIA: Same thing.

Like I said earlier, we have all these materials from the tank survey. We know what percentage should be submerged, what percentage should be not submerged. It's all calculated so that's how we dive it up as to how many coupons are in the --

CHAIR WALLIS: You're not going to throw in any latent dust?

MR. HSIA: No. At this point there's no point in throwing latent dust. Concrete. For concrete, yes. But there's no latent degree --

CHAIR WALLIS: Vacuum up a little containment and throw it in there and see what happens?

MR. HSIA: Right.

Oh, by the way, that's one of the conclusion on the national workshop the easier solution that everybody can do is make sure boron material exclusion program is solid. Because you don't want it to be able to suck up tons and tons of dust of debris in your containment.

MEMBER FORD: So this will be circulating --

MR. HSIA: Yes?

MEMBER FORD: It's a recirculating system?

MR. HSIA: Yes.

MEMBER FORD: The water quality is essentially PWR primary water?

MR. LETELLIER: Yes, initially.

MEMBER FORD: Initially?

MR. LETELLIER: Then it gets --

MEMBER FORD: And then it just slowly get more and more gunged up

CHAIR WALLIS: Don't you find sodium hydroxide?

MR. HSIA: Yes.

MEMBER FORD: Yes.

MR. HSIA: I see whether I have a viewgraph. I think there are viewgraphs we talk about. Right here.

Right now we've planned for six tests. The first test is 30 days with the Nukon fiber. Hydrochloride. It's listed there. And that's NaOH at pH 10. The second test -- now this first stage is for 30 day test at 60 degrees in the long term sump temperature.

The next test would be the same fiber material, insulation material but using trisodium

phosphate, pH 7. Everything else stayed the same.

And then we go to Cal-Sil. Cal-Sil seemed in our view -- not feeling, in our view we believe that's a worse actor than fiberglass. So that will give you four tests.

And then a fifth, we'd probably try to reproduce one of them just to make sure the data. And then a sixth, if there other combination of insulation other, we can test so. So right now we're looking at six tests.

And after the first one, hopefully, the other ones will be shorter duration. But right now we don't know how long it's going to take. If it reaches some kind of equilibrium, we'll just call it done for that test.

MEMBER FORD: I realize you called this a realistic test at the very beginning.

MR. HSIA: Yes.

MEMBER FORD: And your realism may come in from the fact that all of your specimens in your little block dots --

MR. HSIA: Yes.

MEMBER FORD: -- and different species.

MR. HSIA: Different species, correct.

MEMBER FORD: So you're only method of

analyzing the data is to look at the specimens.

MR. HSIA: No, we have water. We collect water samples every day. There is a qualified water lab, I think it's -- yes, at the last bullet. Daily water chemistry monitoring. It's sent off to our chemistry lab that's qualified --

MEMBER FORD: The thing that we're really worried about is what is the corrosion product you've got?

MR. HSIA: Yes, we can look at the coupons. At the coupon and look at that, too. But you get some indication just from the water chemistry.

MEMBER FORD: So your whacking this metallic sample, whatever it might be with water.

MR. HSIA: Right.

MEMBER FORD: There will be corrosion product formed on the specimen surface.

MR. HSIA: Right.

MEMBER FORD: There will also be corrosion product formed by dissolution precipitation reactions in the bulk water.

MR. HSIA: Correct.

MEMBER FORD: But you have no way of controlling that in terms of -- you're falling back on the realistic descripter.

MR. HSIA: Correct.

MEMBER FORD: You don't have well controlled experiment?

MR. HSIA: In what sense?

MEMBER FORD: Because you changed all your specimen. You've got a random array of material and area of each of these materials which may not necessarily be representative of the containment.

MR. HSIA: We certainly hope that's representative.

MR. GISLON: John Gislon again.

The so-called scaling that was selected there was meant to replicate the --

MEMBER FORD: The relative areas --

MR. GISLON: -- the sump volume in a containment of about 600,000 gallons down to the 250 gallons in this tank with the relative areas in the volumes of material which include galvanized material, the coated zinc, the fiberglass that would have been dislodged during a postulated accident and so forth. So that ratio was maintained in this experiment.

MR. HSIA: That is the scaling.

MEMBER FORD: That is not variable?

MR. HSIA: No, the surface areas, those are not variable.

MEMBER FORD: The surface area and the mixture of the materials you've got in there --

MR. HSIA: There are not variable.

MEMBER FORD: -- are not variable. Your only variable is temperature, presumably at some time or other?

MR. HSIA: pH value.

MEMBER FORD: ph and velocity.

MR. HSIA: And buffering, that's the pH.

MEMBER FORD: What about velocity?

MR. HSIA: Velocity we did not plan to change that, 3 to 5 percent per second.

MR. MURPHY: Tony, Mike Murphy from NRR.

Temperature is not a variable either, if I recall the --

MR. HSIA: Sixty degrees, test is not a variable.

MEMBER FORD: Well, in the containment when you've got this break occurring, you've got high temperature pressurized water spraying onto some of the insulation and you've got it all the -- I mean, you've got a wide range of temperatures all of which will effect the dissolution kinetics.

MR. HSIA: For the coupon we do two things, and I think it's listed here. We do a pre-

aging, I think John described earlier before we put in the test loop we pre-age to simulate the 15/20 year material. That's one.

Then we go to the lab. The lab will precondition some of them.

MR. LETELLIER: I'm sorry, I have to correct that, this misimpression. Based on the modeling that we've done, the contribution from the high temperature phase for corrosion products is very small compared to the contribution at moderate temperature for a long term. And therefore, we've rationalized that we will not have to precondition to account for the high temperature transient with the possible exception of fiberglass which has its own concerns for resin degradation.

MEMBER FORD: Are you constrained in your timing and budget or whatever it might be in doing a well controlled experiment on just say one material and just --

MR. HSIA: One material, because that's separated --

MEMBER FORD: The controlled experiments effect the test on one material.

MR. HSIA: Okay. So you get the data, it's well controlled, then what?

MEMBER FORD: Well then you --

MR. HSIA: What you know is corrosion rate or leaching rate of this material. But the whole point is chemical reaction of all these things; aluminum --

MEMBER FORD: All I'm saying is you're going to have this realistic combination of materials. And you're going to be controlling your, whatever it was, ph and temperature, etcetera. And the output is volume of some stuff, maybe crystalline or gelatinous. You have no idea how it formed, the kinetics by which it formed.

MR. LETELLIER: You're correct. I don't think we'll know the kinetics --

MEMBER FORD: And it could well be negative test. You may come up with nothing.

MR. LETELLIER: But the first objective is to decide whether or not there are adverse products formed. So we are monitoring the system to look for those products of concern.

MEMBER FORD: So now I see here you've got some sort of kinetic analysis.

MR. HSIA: Yes. We've monitored the test facility and we do daily chemistry on it. So you're right, I don't think we'll be able to find out the kinetics of the chemistry on a certain product, on

certain metal or certain insulation.

MEMBER FORD: I'm just concerned that you've only got three months to do this and you may turn out in 3 months to have no useable data.

MR. HSIA: Well, if it comes out, that means there's nothing formed, I would feel pretty comfortable that the chemical effect is not a significant factor.

MEMBER FORD: The only you've got is Three Mile Island they found some gelatinous stuff, didn't they, as I understand it? So you've got to replicate that one data point.

MR. HSIA: No, we're not trying to replicate. We're not trying to replicate Three Mile Island at all.

MEMBER FORD: You're replicating something.

MR. HSIA: Because that's 00

MEMBER FORD: That's something that actually occurred in a containment.

MR. HSIA: All we know is some green stuff looks gelatinous, we have no idea. We took -- we didn't know --

CHAIR WALLIS: They had a lot of other chemicals, too, presumably, but at least from the --

MEMBER FORD: That's what I recall.

MR. ZIGLER: I'm also a member of the peer review panel that reviewed this experiment.

MEMBER FORD: Ah. Yes.

MR. ZIGLER: And one of the main completeness that we had -- and we submitted back to the NPI and to the NRC was it clearly establishing the criteria of when gelatinous material is formed either by use of the viscosity or something like that. So we would have a very clear indication that it was accepted by all the gelatinous material did occur when -- bink, whatever is the acceptance criteria. Because the one thing that we don't have in this whole test is that all of a sudden somebody sees a little blob of something, a green blob somewhere stuck in the middle of a little piece of foam or something like that, and we all go, hooray, oh, how horrible we have gelatinous material. We want a clear, defined acceptance criteria for that. So that's exactly to preclude what you're talking about, sir.

CHAIR WALLIS: Well, it's a very rudimentary experiment, really. It's a try it and see what happens. Isn't that the level it's at. It's not trying to define a whole --

MEMBER FORD: That is true. And it is

unashamably that.

CHAIR WALLIS: Right.

MEMBER FORD: And the question is what's the risk of doing that quick and dirty experiment?

MR. HSIA: Well, I beg to differ. I wouldn't call it quick and dirty. It's deliberate design.

MEMBER FORD: I didn't mean to insult your work.

MR. HSIA: We are not designed to figure out the kinetics of chemical reactions on certain species, if you will. You're right.

MEMBER FORD: Okay.

MR. HSIA: We will not be able to demonstrate to you or anybody else that we know this is what happened to zinc, this is what happened cooper. It's not there.

CHAIR WALLIS: So all you're trying to do is translate this into some sort of a method for analyze what happens. Presumably eventually if it is a problem, you need to have a method for analyzing. If it's a problem, you're going to have to analyze what's going to happen and then some of the chemistry.

MR. LETELLIER: But the key question is if it's a problem, and that's what the initial baseline

test is designed to do, is to look for indications for adverse products.

CHAIR WALLIS: Then maybe it's another year's work before you're in a position to predict anything?

MR. LETELLIER: Depending on the severity and the rate of production of an adverse product, we will redesign the test matrix and reestablish what our expectations are for that phase.

MR. HSIA: Let me just say one more thing, Ralph. We do simulate the spray, so the OB spray now goes on top of the test facility. So in our view it is really realistic. And then the data we get, if there's nothing formed, that's one way. If there's materials formed, we'll know what they are. But we just won't be able to use to data to do analysis.

CHAIR WALLIS: If something happens but it's not very extensive, is it significant? I mean, you may make some stuff, but if you have no idea about the kinetics of it and so on, you don't really know how to extrapolate this to real situation. What you're hoping is you won't see anything, I suppose. But you'll probably see something and the question is how significant is that going to be.

MR. HSIA: B.P. is right. As you point

out, we're hoping this OLI program will be able to track a base. If that could be validated, then that program could be a tool to analyze whatever each specific plant may have and see what kind of chemical species that were generated.

MEMBER FORD: It's very dangerous to use some of that dynamic calculations for kinetic evaluations.

CHAIR WALLIS: You can't.

MEMBER FORD: You can't. You can't.

MR. HSIA: With chemical species that can be calculated.

MR. LETELLIER: Well please consider the time frames. With the exception of the jet, the blow down jet and perhaps the onset of a precipitation event, the time scales are much slower than you might think, which lends credibility to the application of a pseudo-equilibrium model. You're talking about a slow introduction of corrosion products, relatively slow compared to reaction rate.

MR. CARUSO: What are you going in the vary in the set of three tests? What's the difference among the second --

CHAIR WALLIS: The temperature.

MR. HSIA: The first test was started and

we're done. It was cut off.

MR. CARUSO: Right. Right.

MR. HSIA: Then we're going to go to the second test?

MR. CARUSO: And what's going to change?

MR. HSIA: The second test will be using trisodium phosphate, pH 7.

MR. CARUSO: Okay. So pH is going to change. And then the third test?

MR. HSIA: Third test is calcium instead of --

MR. CARUSO: And the fourth?

MR. HSIA: And the fourth is -- calcium has got 2 pH and Nukon. It's got two. That's four.

MR. CARUSO: Oh, okay. Okay. so it material and pH that's changing.

MR. HSIA: Yes.

CHAIR WALLIS: I'm not sure we're going to write a letter on the chemical tests. I'm wondering if we've spent enough on this. So your kinetics are not rapid enough. You told us we wouldn't see you very long, and you seem to have difficulty extracting yourself from this Subcommittee.

MR. HSIA: I don't know if you're trying to kick me off here.

CHAIR WALLIS: We will. Okay.

MR. UWIKEWICZ: Steve Uwikewicz with NRR.

This is not the only data point that we have here. The five points of testing that we've done with Wiley Labs that, though it has not been part of this, is not specific to the chemical effects, but certainly they were a set of containment conditions with a very deliberate attempt at putting together a containment that really mixed, if you will, one of the -- run constantly for in effect five months.

Now, there's information that we can extract form that that will help us and has helped us on other parts of the decisions and some of the things thinking about. So we use them for balancing effects, but they also can be used and the data from them probably will be used as we go along evaluating chemical effects. Because we have the paint chips, we have the calcium -- all those other kinds of bits and pieces and parts as part of that literally five months of testing which hasn't been used. We will be incorporating that into our decisions and safety evaluation.

Now you may be talking about that later, but --

MR. HSIA: No, I'm not going to talk

about.

MR. UWIKEWICZ: Okay. Understand that there is more data than you see here and we've had under consideration.

CHAIR WALLIS: Does it indicate that there's a problem or not?

MR. UWIKEWICZ: From my observation of those tests I have not seen it.

CHAIR WALLIS: So the indication from those tests is that this is not a serious problem?

MR. UWIKEWICZ: Those tests were not set up to do the same things --

CHAIR WALLIS: Okay. So we don't know?

MR. UWIKEWICZ: Those results should --

CHAIR WALLIS: I mean, if those tests show there are chemical problems, a very important thing, then we might say wait a minute you can't issue all this stuff until they've been resolved. But you're not telling us one thing or the other here.

MR. HSIA: What have the Wiley tests told you?

CHAIR WALLIS: What did they tell you?

MR. UWIKEWICZ: They're proprietary tests and I'm not at liberty to discuss this in this forum.

CHAIR WALLIS: Well why bring them up

then?

MR. UWIKEWICZ: Why? Because this is not the only bit of information that we have been using as we consider resolution for this.

CHAIR WALLIS: I see. But it doesn't help us if you've got something which we don't know.

MEMBER RANSOM: On this particular test plan is there anything to rule out any bacterial effects?

MR. HSIA: We really haven't considered any bacterial effects.

MEMBER RANSOM: What if you get bacteria in this and get a bacterial film? Because like at TMI, they lived on hydraulic fluid and they didn't mind the radiation environment at all.

MR. HSIA: They didn't mind a pH of 10?

MEMBER RANSOM: I don't know, they lived there. What do you do to guard against contamination that you might get this kind of thing?

MEMBER KRESS: Throw in some chlorine.

MR. HSIA: Bacteria or river water, I don't know. That's very plant specific. I don't know. You know, some plants may not have that problem, some plants may pump chlorine material including bacterial introduced.

MEMBER RANSOM: Well, I'm not so worried about in my own case, I guess, thinking about the plant because you're kind of coming from the primary system. I don't believe there are going to be -- well the bacteria could live in the containment, presumably, although it's pretty hot I think.

MR. HSIA: Yes.

MEMBER RANSOM: And then generate in the sump, you know, lead to this kind of thing in terms of long term cooling.

MR. HSIA: If you have some information we can try to learn about it and then --

CHAIR WALLIS: That is interesting, though. That you have sort of humid damp conditions down in the sump, there may be all kinds of stuff growing on the walls if it's anything like my basement, but I'm sure it's not.

Well, maybe we're getting a bit off the subject here. Can we try to get to page 21 first?

MR. HSIA: Yes, sir. I'm there.

First test starts middle of August.

CHAIR WALLIS: In 30 days it's August 31st. That doesn't seem to make sense.

MR. HSIA: Let's me see. No. What we're thinking is we've got some preliminary data, because

data -- we're trying to get data out as soon as possible. And we're also pushing. I know LANL is not willing to commit, but we're trying to push --

CHAIR WALLIS: Is this timed with the ACRS meeting.

MR. HSIA: If we have data, I'll be more than happy to come and present it. But all tests we really need to get that completed.

CHAIR WALLIS: So by August 17th meeting there's going to be some flash news and say after two days everything dissolved.

MR. HSIA: I can assure you if that's case, we'll come here wave the flag and ask for time to do that.

And like I said earlier, if there is gelatinous material formed, we'll direct our focus to head loss. That's it.

CHAIR WALLIS: Thank you.

What's next on the program?

MR. JAIN: Calcium.

CHAIR WALLIS: These are very short? These are very short matters that we're going to discuss, I think.

MR. JAIN: They're supposed to be only 20 minutes.

CHAIR WALLIS: I don't see how we can let you speak without interrupting for 10 minutes, if that's mostly your time.

MR. JAIN: Well, this is only one slide. It's more for completeness.

CHAIR WALLIS: Okay. So we'll abandon the 10 minute rule then.

MR. JAIN: Yes.

This calcium test was done last year just the report came out this year. But we have presented with those to the Committee last year. And it's in ADAMS, the document is. And the findings, basically of these tests were that Cal-Sil could be generated into fine particulates and it could cause substantial head loss.

And then the second finding was that there is a correlation 6224 that can be used provided we use the appropriate hydraulic property. And those properties based on the test were recommended to be like 880 -- that's one of the properties, specifics of this area. It compared just for your perception, if you think perspective, the fiberglass is 171,000 --

CHAIR WALLIS: Don't these numbers vary a bit? I can't remember. In the report I read there seemed to be from experiment to experiment some

variation in this feet squared per foot cube.

MR. JAIN: Well, the 880 does include some factor of safety or to account for variability. I don't exactly --

CHAIR WALLIS: It's an extreme value or something?

MR. JAIN: That's right.

MR. LETELLIER: It's a reasonably bounding value for the suite of experiments that it was benchmarked against.

CHAIR WALLIS: The site is very small.

MR. CARUSO: Yes, for calcium silicate?

MR. JAIN: So the plants which have Cal-Sil could have substantial head loss so we need to evaluate that. And that has been out to the industry even last year, so it's not news.

CHAIR WALLIS: The message is if you know your specific surface area and you know the proportion of these constituents, then the head loss correlation works. That if you've got the inputs into it.

MR. JAIN: Absolutely.

MEMBER FORD: And how would you know that before the event?

MR. JAIN: Well, you know the inventory, how much debris. Then you carry it through the

transport --

MEMBER FORD: And again from the discussion that they had yesterday it was discussed in depth. You know, the size of the fibers which were being analyzed. And the change from initially long fibers, which was in the inventory, to very small fibers as it was mashed up going through the pumps, etcetera. So which one do you use?

MR. JAIN: Well, the Cal-Sil which we used was the small fibers. I mean after the accident. And what you will see in the pool basically.

MEMBER FORD: The reason why I'm asking the question, B.P., is just thinking okay now I've got analyze what my head loss is. You've got this correlation from 6224, but it depends on the input to the model. So how sure are you about the input to the model in terms of the size of the particles?

MR. JAIN: Well, in terms of Cal-Sil you would do exactly the same what you do for Nukon fibers or anything. So that methodology doesn't change. It's the different material, different property.

CHAIR WALLIS: Now on these beds that form on the filters in the real situation, doesn't it matter a bit about what deposits first? I mean, if you deposit a lot of fibers first and then you stop to

filter out the fine particulates, the particulates will sort of go on the first layer, they won't sort of uniformly distribute. And if they laid down at the same time, there'll be more uniformly distributed? I think that would make a difference if you got a layer which was very dense in particles, that would be your thin film effect right on top of a mat.

So the time at which those things get deposited make a difference?

MR. LETELLIER: Clearly there is a difference between a surface filtration effect and a body filtration effect. In all cases, and the industry guidance reflects this, the thin bed effect is considered a plausible bed formation that it possibly could form first, it could be the substrate to anything that follows or it could exist alone by itself.

In general if it does form it will drive the conservative head loss assumption. And so that condition is assessed.

As far as the application of the 6224, it is inherently a homogeneous approximation. There have been attempts to build beds in layers and looking at a resistance type of model. But in general it is applied as a homogenous mixture.

And, again, we don't have predictive capability to guess how the debris will arrive, in what order. And so it's appropriate to examine the thin bed conservatism. We know that that is a plausible condition for an integrated test where finely divided individual fibers can assemble or accumulate in a very uniform way on a vertical string.

CHAIR WALLIS: So there's this thin bed conservatism, is that realistically conservative or is that ultra conservative?

MR. LETELLIER: No. I just said that if we believe that it is a very plausible mechanism.

CHAIR WALLIS: But, you know, if you're asked to assume it, is it ultra conservative or is it realistically conservative?

MR. LETELLIER: No, it is realistically conservative because it is a plausible event and we've measured it and under appropriate conditions.

CHAIR WALLIS: So it's likelihood is significant percent of something, probability of happening is not ten to the minus six. It's something like a few percent --

MR. LETELLIER: Yes. In fact, in some cases I believe it might be the dominant mechanism.

CHAIR WALLIS: In other words, the

probability is something, maybe 10/20 percent, not something you'd think of as small?

Is that all you have for that?

MR. JAIN: That is all.

CHAIR WALLIS: Getting us back on schedule very rapidly. I mean we're going to get ahead of it very soon, I think.

Who is next? Is there something else that takes a few minutes or would we take a break now.

MR. JAIN: Well, I think we've got a lot.

CHAIR WALLIS: Is it time to take a break?

We'll take a break until 3:00. Any objections. To be overruled. Okay. We'll take a break.

(Whereupon, at 2:41 p.m. a recess until 3:30 p.m.)

CHAIRMAN WALLIS: We'll come back into session, please.

MR. LETELLIER: Dr. Wallis, before we begin the presentations, may I make a clarification?

CHAIRMAN WALLIS: Yes.

MR. LETELLIER: I may have given the Panel a mistaken impression that the formation of the thin bed is guaranteed and that's certainly not my intent.

CHAIRMAN WALLIS: No, it is likely.

MR. LETELLIER: It is a plausible mechanism. It depends on factors as any head loss vulnerability assessment would on the velocity interest screen, the amount of screen, the amount of debris that's generated.

I didn't want to leave you with that impression that just because it's in the industry guidance right now, that there's uniform concurrence.

CHAIRMAN WALLIS: No, I think we understood it was a realistic conservatism.

MR. LETELLIER: Good.

MR. JAIN: Yesterday, there was discussion on latent debris. LANL had just completed their latent debris project. And I'll report some of the key results of this study.

Their study looked at latent debris samples provided by five plants. In the bottom line of their study, really is two things. One, the major portion of this latent debris consists of fine particulates and thin fiber, not a surprise.

And number two, the NUREG-6224 correlation can be used, if you use appropriate title of properties.

So with that bottom line, I'll just proceed to the slides. The latent debris is basically

defined as a pre-LOCA debris. It consists of dust, dirt, insulation fiber, clothing fiber.

CHAIRMAN WALLIS: There are no things that live in these containments, are there? There aren't insects and things like that?

MR. JAIN: I guess it just depends on the samples we got. I don't believe we got --

MR. LETELLIER: There is certainly a cabaret of latent debris that you could consider biological like bird feathers, insect wings, crickets. These buildings are open for 30 to 40 days at a time.

CHAIRMAN WALLIS: So there are insects in there, that die in there.

MR. LETELLIER: Yes.

MR. HSIA: On the other hand, before they start up. A good practice is to clean it up.

MR. JAIN: Industry provided a fine warranty of plants, and provided samples and I just want to caution that the study is based on the samples. So each plant has to evaluate the results in light of the what their practices are for collecting dust, measurements, the geometry and so on and so forth. So it's not uniformly across them both. The warranty of plants did have different methodology of collecting, providing samples.

MEMBER KRESS: What do you think of the NEI collection methodology?

MR. JAIN: Well, I guess each plant provided samples and I understand there was variations of the method to collect samples.

MEMBER KRESS: How do you know the method was what caused the variation and not the amount of latent debris?

MR. LETELLIER: I think the characteristics of the particle size distribution are indicative. When the plants used the HEPA filter or a physical swipe, we saw evidence of 10 micron particles and smaller. When the plants used metal scrapers or bristle type brooms, there was no fraction, almost zero, below 75 microns. So it is important how you characterize your debris.

MEMBER RANSOM: How you characterize it or how you collect it?

MR. LETELLIER: How you collect it is important for characterizing the inventory.

MR. JAIN: And the study does not dwell on the total quantity we collect, so it just looks at the characterization only.

The general observation was that particulate fractions significantly exceed fiber for

most samples, but by the same token, you do find fibers in the debris.

I'll show you some pictures of the latent debris at one of the plants and it shows the fibers, the particulates and other. It shows plastics, paint chips, metal foil, that sort of thing.

This shows a picture of particulates which are greater than two millimeter. Fibers. It's all mixed together.

That's what the particulate looks like, 500 micron to 2 millimeter which is even finer. Seventy-five to 500 micron. And the particulate is less than 75. So that's just the range of particulates.

MEMBER RANSOM: What was the relative amount?

MR. JAIN: About 40 percent of the particulates are 75 microns or less.

CHAIRMAN WALLIS: By mass?

MR. JAIN: By mass, yes.

MEMBER KRESS: So those things are going right on through the delta and into the plant?

MR. JAIN: Some of them do, yes, about 25 percent or so.

CHAIRMAN WALLIS: Unless they crawl up in

the thin bed.

MR. JAIN: That could happen yes, because there are fibers in there. I'll show the particulate to fiber mass ratio in those samples. Fiber could be as much as 15 percent and particulates --

MEMBER KRESS: Are these separate plants?

MR. JAIN: Yes. A, B, C, D.

MEMBER KRESS: A, B, C and D?

MR. JAIN: Right.

MEMBER KRESS: Those are the plants. And the difference between 1, 2, 3, 4 and 5 are different sampling methods?

MR. LETELLIER: Those are actual individual bags that were sealed. Those were where the samples were large enough to make assessments.

CHAIRMAN WALLIS: From the same plant?

MR. LETELLIER: Yes. They collected from multiple locations all over the plant and tried to relate that to the surface area. They were responsible for extrapolating to total inventory, but we did have that information available.

CHAIRMAN WALLIS: Now take B6, I notice that the fibers are only 40 percent of the weight of the particles, but by volume the fibers are probably more than the particles because they puff up more.

MR. JAIN: The volume would be more or less.

CHAIRMAN WALLIS: So I think about how they might sit on the screens, the smaller weighted fibers plays a bigger role. The volume plays a bigger role than just the weight, doesn't it?

MR. LETELLIER: When you're assessing the potential for thin bed formation against a rule of thumb like 1/8th inch of thickness, the density, the packed density is the important value. And we've made recommendations as to what density should be used.

When you're trying to assess the proportion or the amount of fiber, the mass ratio seemed to be more usable. Everyone, I guess the community has been discussing how many pounds are present and estimates vary between a minimum of a 100 to a maximum of 500 and we're converging on an answer, but this kind of a rule of thumb will make it easy to guesstimate the range of contribution from fibers. And again, as B.P. pointed out, this is indicative of the variation in the samples that we assessed.

Now the plants may have additional experience that could help us understand the full range.

MEMBER KRESS: If I were going to be

realistically conservative, would I use the B6 sample or the B5?

MR. LETELLIER: We recommended 15 percent.

MEMBER KRESS: Fifteen percent, sort of an average?

MR. LETELLIER: Right.

MEMBER RANSOM: How were these collected? I mean after an outage or just prior to an outage?

MR. LETELLIER: In three cases, we fully examined four samples. Three of them, I believe were after plant cleanliness operations and one was before plant cleanliness.

MEMBER RANSOM: You don't mean they cleaned and then you collected the samples?

MR. LETELLIER: That's what I mean.

MEMBER RANSOM: So this was what was left after they cleaned it?

MR. LETELLIER: That's right. Our assumption which we've tried to emphasize is that we're looking at the proportion of composition and we're assuming that that's constant regardless of the status of cleanliness. The amount of fiber, the amount of particulate is pretty much the same. And so we have not dwelled on the amount of sample that was sent to us.

The only concern we had regarding amount was simply usability, can we actually measure these attributes.

MR. CARUSO: So which of these samples was before cleaning and which was after?

MR. LETELLIER: I don't know. And again, it's irrelevant, under my stated assumption.

MR. CARUSO: Didn't you try to test that assumption to determine if it was valid?

MR. LETELLIER: We have no way to do that.

MR. CARUSO: I just thought you would compare the --

MR. LETELLIER: We did compare the compositions between plants and in general, this is the variability that you see in the proportion of fiber particulate. We didn't see a great difference in the particle size distribution between plants. We could not correlate the known insulation application to what we observed in the debris. For example, the fiberglass plant did not have fiberglass visible in the debris.

So in general, dirt is dirt. That's one of the conclusions that we came to.

MR. JAIN: So with regard to characterization of the debris, particulate size

varied all the way from 2 millimeter all the way up to 75 or less. And latent fiber are longer and thicker like 15 to 25 micron and if you compare their -- fiberglass is only 7 to 10, so it's much thinner fibers.

Now since the samples were radioactive, so could not be tested for head loss directly, LANL had to come up with a surrogate debris composition in order to calculate the head loss. And what they tried to do is to maintain the same composition and distribution of the particulate size and the flow characteristics. And they used clay-based soil and sand to replicate the particulates and the fiber, glass fiber for latent fibers.

And then the head loss test, and they were able to get the correlation 6224 is still applicable with the average value of specific surface area of 106,000.

CHAIRMAN WALLIS: That's very different than 880,000.

MR. JAIN: That was for calcium.

CHAIRMAN WALLIS: Yes.

MR. JAIN: That's right.

CHAIRMAN WALLIS: The report is just prepared and it should be available I guess on the

ADAMS in a couple of weeks perhaps.

MR. HSIA: Probably later than that because we're sending a draft report, the final report to NRR.

MR. JAIN: So I guess it will be available in two to three weeks.

MR. HSIA: I would put it in August.

MR. JAIN: August time frame.

MR. LETELLIER: A couple of comments regarding latent fiber. Fibers are difficult to manage because first of all there's no equivalent definition of as manufactured density. Fibers were collected in the plant pretty much individually. They're separate. They don't appear in clumps. They're not part of a manufactured blanket. So finding a surrogate fiber type is problematic. We considered dryer lint and pocket fuzz and all matter, cellulose and inorganic components. In the end, we defaulted to recommending the properties of fiberglass for a couple of reasons.

First of all, the comparison of fiber diameters means that fiberglass properties should be slightly conservative because the fibers are smaller, the surface areas are higher, specific surface areas.

Second of all, we argued that in the

assessment of thin bed formation, there are plants who do not have fiber insulation. They have reflective metallic and latent fiber is the only potential for building a filter mat. In that case, if the thin bed did for, it's likely to be dominated by the particulate properties. The fibers just provide the filter medium.

In the other set of plants where there potentially is fiberglass debris being formed, the bed will be dominated by the fiberglass and the latest fiber will be a minor contribution, and therefore that recommendation is a significant simplification. It seems reasonable.

The other aspect to note on the third bullet from the bottom is that 25 percent of the fine particulates seem to penetrate the fiberglass bed quite easily and continue to circulate and that's not a behavior that we observed from calcium silicate and so we had enough difficulty managing that aspect of the experiment that we're willing to make that recommendation as an adjustment to your estimate of total latent particulate in the bed.

However, keep in mind that we tested this separately, not in combination with other materials, so it does depend on the amount of compaction that you

induce in the fiber bed.

MR. JAIN: The next one is downstream effect tests which Bruce will describe in more detail what we have done so far.

MR. LETELLIER: Downstream effects have two components from the outset of staff's planning for this work. We recognize that the existing equipment at University of New Mexico for which we call the large flume, we've reported previously we looked at the separate effects of incipient flow velocities in a large open channel. That piece of equipment was available earlier than our resources for doing the throttle valve blockage or any kind of component effects. And so we have a two-phased test plan. First of all, to look at some screen penetration in the large linear flume and then second of all, to look at the potential blockage mechanisms for high pressure valve, using two different approaches. One to use a purchased commercial equipment similar to that in service and second of all to manufacture or construct a simulated valve assembly that has a typical throttle valve orifice and internal flow complexity, but something we can disassemble and examine quite readily for the various mechanisms.

It was also -- I'll show you a schematic.

It's also designed to be flexible so that we can put in different sets of valve internals and look at the range of features.

The primary objectives are first of all to demonstrate the potential penetration of diverse debris types and sizes. We're looking at typical screens between 1/4 of an inch, 1/8th inch and even 1/16th of an inch which is not necessarily representative of in-service sump screens, but it might indicate a margin of value for that type of penetration.

We're also examining various potential blockage mechanisms of a high pressure orifice, all the way from gradual accumulation on a hard type of debris fragment, sort of a nucleation site that's lodged inside of the throttle value, all the way to the concept of sort of an instant compression of a dilute high debris loading inside of a stream.

CHAIRMAN WALLIS: I have a hard time imagining this rather fluffy stuff blocking that. The orifice and line has high flow rates in it?

MR. LETELLIER: The flow rates inside of the throttle valve are not as high as you might expect, but the potential of pressures, of course, are. There is the issue of potential self-clearing,

scouring effect as the velocities increase, maybe the debris would be dislodged.

We did consider that potential in how we rated our pump capacity and I can't recall if I get into that. It's important for us to examine the -- I guess you'd say the most conducive set of conditions for blockage and that would be low flow and low pressure.

We rated the capacity per pump so that we do have margin to both look at the onset of those conditions and also increase the pressure to at least assess the potential for scouring to self-clean the valve.

We'll also be examining these components for evidence of ware. The pump, we would like it to survive through the duration of our test matrix. At end of life we'll disassemble it and look at evidence of internal accumulation and where. The screen penetration tests, there are four panels to this figure. This shows you both the plan view looking down from the top of the linear flume and an elevation that shows a circulating loop. The water is pumped in at one end with some flow straightening baffles to smooth out the flow. It is channeled through plywood baffles to achieve the velocities of concern.

The test screen is the first impediment which represents 1/4, 1/8 or 1/16 and a catch or capture screen is a very fine 200 count window screen, basically.

We're putting in the protypical debris types that we've tested previously. The Nukon shredded into a range of size distributions. We're also looking at pre-blended fiberglass, very typical or similar to what the gentleman from EDF showed yesterday where it's been chopped into individual fibers. We're looking at ranges of RMI, reflective metallic foil crumples, if you will.

This is the test matrix in the bottom that shows the combination at present that we're considering testing.

Water velocity is important. There are phases of transport during cool fill-up, for example, where the water velocity near the floor could be quite large. We need to assess the potential of large objects, nuts and bolts, wire nuts, particles of plastic. Everything that we observed in the latent debris samples, even though they might not transport at recirculation velocities, there is a phase where they impinge the screen. If they did penetrate, they would sit in the sump until the recirculation demand

took over.

The lower right hand inset is simply an example of the data format. This is typical data presentation for very fine fiberglass penetrating a one quarter inch screen. The photograph shows you what the thin bed looks like on the capture screen and the masses here are the initial mass, W naught. W1 is the mass remaining on the test screen and W2 is the amount on the capture screen. And in this way we can assess the proportion of penetration for different debris types.

Once this test matrix has been evaluated, then we will know how to appropriately challenge the throttle valve, how much material should be placed through the loop at any one time. We expect that depending on the survivability of our pump considerations, we may couple the throttle valve test object at the discharge. Here at the outlet of the tank, we will place a high pressure pump, the test object and then the return path, so that we have a continuous circulation. That would allow us to get some estimation of the effect of service life under a given concentration loading, for example.

For other debris types that we do not want to pass through our pump, we've designed a mechanism

for pre-loading the debris downstream of the high pressure pump.

We've talked before about the variety of valve types that are in service. Our intent is not to replicate any single design, but more to the point to look at the physical mechanisms and potential for blockage to occur. This is a prototypical globe valve, similar to what we purchased for testing. This is one exception that I wanted to note. There is a specialized valve design for anti-cavitation. It's intended to burn off extremely high pressure drops in a small space.

According to our best available information, this valve design is not in service in a HPSI throttle valve system. They are used in high pressure lines within the plant, but our task right now is focused on the HPSI system, in particular. So this will not be tested.

Our pump conditions, our capability of ranging from 300 to 500 psi and volumetric flows between 50 and 75 gallons per minute. These are very representative of the initial conditions for throttle valve service. If the valve started to block, obviously the HPSI pumps have enormous capacity to compensate for that differential. We cannot safely

test that at the University of New Mexico, but we have tried to maintain enough margin in the pump performance curve so that we can start to examine the effects of increasing pressure.

And similar to the time scale of our other test programs, we expect preliminary results in August of this year. Our pump is being delivered within the next month and I'll show you the design of the surrogate valve which is scheduled to -- it won't take more than 2 to 3 weeks to manufacture. And currently, we are designing the balance of the plumbing, so that we can procure the equipment.

This is an exploded view of our surrogate throttle valve assemble. The important aspects to note are that the valve stem, the vale seats are completely interchangeable, so that we can examine different contact angles, different flow lengths, relatively easily by pulling out the core of the upper body.

It's been designed for the flexibility of having an over/under flow channel or a direct impingement from the bottom, if you will. Those flanges are completely interchangeable so that the assembly can be rotated to examine both of those conditions.

That's the conclusion of what I have to present on our downstream effects testing. Again, our principal concern is looking for potential mechanisms for blockage under tight tolerance of flow conditions and also characterizing the amount of debris penetration from the screen. I think you should note that currently we are testing the screen in its clean configuration. We are mixing up prototypical debris, introducing it to the flume. It impinges on a clean, unimpeded screen and then we characterize the mass fractions.

There will be criticism and more discussion about what you believe to be representative in the accident condition, whether debris pre-exists on the screen and what those proportions might be.

BP reported the penetration fraction for very fine particulates. That represents the migration through an existing bed and so these two test programs have been complementary in that respect.

CHAIRMAN WALLIS: You didn't look at any tests of blocked to in core pieces like screens or --

MR. LETELLIER: Not under high pressure flows. The capture screen perhaps represents the closest condition to the screen in size of a fuel filter.

MR. UWIKEWICZ: There has been some publicly available testing, high pressure injection pumps with patent debris. People will be presenting later on, next month, by Davis-Besse folks on their experience and their experience is post-LOCA debris and the wear effects of tight clearance components. We will be able to use and that information will be available in the next couple of months. There's also some data that may be available with respect to their five test loops and looking at some of the effects on valves and other downstream components as a result of that testing. We expect some of that to become available in the next few months.

MR. LETELLIER: If there are no further questions, BP will have some information about Knowledge Base Report.

MR. JAIN: This is just to provide you our plans to update knowledge base and the reg guide with questions. We have talked about knowledge base report. We do plan to issue a supplement, once we conclude with staff's programs and evaluate NEI's guidance. So that will reflect more current and up to date knowledge base as applied to PWRs.

Regarding the Reg. Guide we will assess the need at that time to update that.

CHAIRMAN WALLIS: This supplement is going to be a critical review of what's in the knowledge base reports or ordered in some way that says here are the more reliable methods or here are the methods that have been superseded or here are the methods recommended under these conditions and here are the methods recommended under those conditions? Is this some guidance about how do you use this knowledge? Is that what you had in mind?

MR. JAIN: Well, this may not necessarily be an application guide, but it would provide more consistent information to correct some of the criticism you had regarding knowledge base and also provide currently acceptable procedures and methods which one can use.

CHAIRMAN WALLIS: So it will be in a form of which something might have been in an RG-182, sort of a bridge between the requirements of RG-182 and the knowledge base?

MR. JAIN: That's right. That's what it's intended to be.

CHAIRMAN WALLIS: Is it going to be keyed that way, sort of saying this supplement makes that connection, so here's section so and so of RG-182 and these are the parts of the knowledge base that apply

and this is how they should be used or what?

MR. JAIN: I don't think we have really thought through that part or what it intended to be. The idea is to make it more consistent and up to date, integrating the knowledge we are getting from the test programs and NEI's guidance.

MEMBER FORD: Could you give us some idea of BP's timing on this? We've had various times quoted to us, but I seem to remember the idea of the TER being finished in September of this year? Is that correct?

MR. JAIN: That's our schedule, yes.

MR. HSIA: Our test program, particularly the ICET program, we don't expect it to be done until November or early December. So we're thinking the supplement to knowledge base will be early next year.

I think our intent would be try to do the things that Dr. Wallis was referring to, to be able to be a bridge between the Reg. Guide and the knowledge base report. What method should be used and taking into consideration the advantage and guidance.

CHAIRMAN WALLIS: So in a way we'll duplicate the NEI guidance?

MR. JAIN: No. It's not meant to be that detailed. It may be just for reference or everywhere

divulgence. It would not serve to duplicate what's in the NEI guidance. But certainly it will be detailed enough that when we get the directions --

CHAIRMAN WALLIS: Could one say it's zone of influence models. It would say here are these various models and here's the various evidence and these particular models are not consistent with this evidence, therefore we do not recommend they be used and these are the ones that are conservative with respect to this evidence, therefore, they are usable in the conservative sense, but only over some range of geometry or something? Is it going to be something like that?

MR. JAIN: Yes.

CHAIRMAN WALLIS: Critical review of these and the evidence for them and when they should and should not be used.

MR. JAIN: Yes, that's the intent.

CHAIRMAN WALLIS: And when you've got these statements about knowledge base about how -- these air tests from somewhere show a much longer influence than directional jet from the two-phase test which showed a bigger spreading and so on. All that's going to be pulled together and more in the form of -- what does the user conclude from that, presumably?

MR. JAIN: We'll try to make it consistent.

CHAIRMAN WALLIS: I know, but consistency I'm not looking for. I'm looking for advice to the user.

Yes, if it's not consistent, the user will get even more confused. But just -- some of it isn't consistent. I mean if you're going to air test and seawater test and they give different results, how should that be interpreted? It's not just a question of making them consistent. It's a question of interpretation.

MR. HSIA: In the supplement, we will try to make critical the existing model --

CHAIRMAN WALLIS: The user finds it easier.

MR. HSIA: We'll make it more user-friendly than the last one. The last version was just a compendium, a collection of --

CHAIRMAN WALLIS: Are you ever going to dare to say things such as this model was endorsed in NUREG so and so, but it's now being discredited by later information, therefore it should no longer be used?

MR. HSIA: We will dare to say that. We

will find enough confidence to say that's it been discredited or outdated or something.

CHAIRMAN WALLIS: Yes. You probably will say it in a nice way.

MR. HSIA: We'll try to say it in a nice way, thank you.

CHAIRMAN WALLIS: But it still will be clear to the user, right.

MR. HSIA: We intend to make it more user friendly and usable.

CHAIRMAN WALLIS: And you will bring in, as appropriate, the knowledge from overseas from the German and French tests and so on?

MR. JAIN: To the extent it will be available at the time, yes.

CHAIRMAN WALLIS: And is this going to be peer reviewed?

MR. JAIN: Yes. We had the knowledge base peer review, so this one will also be, yes.

CHAIRMAN WALLIS: Does that bring us to the end?

MR. JAIN: Yes, for this portion of it, yes.

CHAIRMAN WALLIS: That's the end of the presentations for today?

MR. JAIN: Yes.

MR. HANNON: I'm John Hannon, the Plant Systems Branch Chief. I want to thank you all for offering us the opportunity to circle back with you after this morning's presentations to try to recap perhaps an outcome that we could both look to as we move forward.

Our presentation was principally designed to gain your endorsement on the Generic Letter, but we did cover the status of where we were on the methodology review and both yesterday and today. We did see that you all were seeking a way to work with us and to be able to add value in that process.

So what I'd like to do is first of all try to focus on a big picture, you know, so maybe we can see how everything would fit together in the process that we're using right now to review this subject.

I just heard some discussion about the downstream effects that is really going to come later than we would really need it for the creation of the SER. But we are going to be doing some conservative engineering judgments to reach our position for that particular aspect. And we have a draft already as to how we would expect to see that subject treated.

But just to go across the top line there,

we've already had the benefit of the revision to the Reg. Guide. It's out there and it's part of the basis for technical resolution. We have the NEI methodology under review and what we're really focusing on right now is how can we interact with the ACRS in a meaningful way to make sure you all will be able to endorse the final product. We're going to have input from the risk-informed approach that you heard about and all that needs to come together on a rather tight time frame.

And then as we move forward into the plant-specific evaluations, they would be informed by what's being done in the area of research that you heard about.

CHAIRMAN WALLIS: I thought what you asked us to do up there is the kind of thing that we're sorrily set up to do is to look at the technical virtues, NEI methodology and maybe any holes or any improvements which could be identified.

And also, the SER, to see whether you have actually covered all of the ground and so on.

There's a technical question which I think we're very set up to do.

MR. HANNON: And what I want to try to do now, is actually walk through the big picture to see

how everything fits together. I want to suggest for us to work together to achieve that.

CHAIRMAN WALLIS: That would contrast that with a Generic Letter which seems to be procedure for achieving sort of compliance with regulations which is not really the expertise of the ACRS.

MR. HANNON: We are seeking your endorsement on that as well.

CHAIRMAN WALLIS: It's as if we were sort of managers of regulatory procedures. I'm not sure -- I guess we're bold enough to give you comments, but it's not really the area where we are particularly qualified.

MR. HANNON: I understand. I think the principal objective right now is to see how we can work together to get your input on the technical evolution for the SER.

So the outcome here, we're down to the end, would be where we have the plant modifications installed and the NRC is in position to do audits of that which again would be informed through the research that we just heard about.

Let's go to the next slide. The specifics of the SER development. As you've heard, we're in the process of coming up with the best available data that

we can to bring to bear on the subject. And when that's not sufficient for us to make -- draw strong conclusions, we're going to be using engineering judgment which will naturally result in conservative response or answers.

The top four focus areas that we have we think right now are going to be relying on engineering judgment and conservative results are the treatment of coating debris, the verification of the zone of influence mapping, the two-phase debris generation, and the debris transport assumption.

Those are the real key areas we have where we're going to be relying on engineering judgment --

CHAIRMAN WALLIS: Excuse me, two-phase debris generation, you mean generation by means of steam and water are somewhat different by means of generation of steam alone?

MR. HANNON: Yes.

CHAIRMAN WALLIS: And this would seem something you have to do experimentally. It would be very presumptuous to say that you know theoretically how to predict how steam and water will interact with insulation.

MR. HANNON: That's why we're going to need to use engineering judgment.

CHAIRMAN WALLIS: Oh, gee whiz. Excuse me, it sounds like -- if you don't have the evidence, it's a pretty bold person who is going to use an engineering judgment.

MR. SOLARIO: I think I'd like to add, Dr. Wallis, this is Dave Solario, what John was getting to is is that if we can't model it perfectly, then we're just going to have to assume a larger --

CHAIRMAN WALLIS: Assume it's all gone.

MR. SOLARIO: Assume more debris.

CHAIRMAN WALLIS: Isn't there evidence? There have been experiments of steam water jet interaction with insulation?

Otherwise, what's the basis for the judgement?

MR. HANNON: To the extent that the evidence -- we're going to use it.

CHAIRMAN WALLIS: Well, there is evidence about pressures that this various materials and so on, isn't there? There's guidance.

MR. LETELLIER: If I may, that database is based largely on air jet surrogates or steam and the question is is there an important degradation mechanism associated with the two basic rule. And if I could give a little different spin on these top

four, I think in every case we do have a basis for making an informed engineering judgment.

However, there's a desire on the part of the staff and I think of the Committee as well to introduce fidelity where possible. These are sort of the last topics where we would still like to attempt to add value to this process, beyond simply endorsing the baseline -- these have been itemized for --

CHAIRMAN WALLIS: It's extraordinarily different. You can clean rust off ships by using droplet impingement. There are droplets in steam. There's droplets that will punch each piece of rust particle off. If you blast it with air, you've got a completely different effect. You don't clean rust off with air the way you do with droplets contained in steam. It's utterly different. Now I don't know if destroying insulation is like that or not.

But a droplet, an individual droplet impinging, locally creates very high pressures which are very different from what you get with air. I don't know if that makes any difference and I don't think I would presume to guess how you take air jet data and apply it to drop ladened steam.

MR. LETELLIER: Again, those are the technical concerns that we share. We're struggling

with those issues, trying to avoid the default conservatism of 100 percent damage. We can mention these different plausible mechanisms and I think the intent of this conservation is to see where the Committee is either prepared to contribute or interested in advising on these topics. And perhaps in some cases the information is not there. The gentlemen are not --

CHAIRMAN WALLIS: I'm very surprised. I'm very surprised that you don't have two-phase debris generation evidence.

MR. LETELLIER: Not specifically for insulation types.

There was a very limited test program. There was an attempt to obtain some of that information. We entered into an arrangement with Ontario Power Generation. It was not followed through to fruition.

MEMBER RANSOM: Even some data with air water, with water droplets mixed into air would give you some evidence of what kind of differences there are and those are rather fairly easy, about as easy as an air test to conduct. And if you get them up in the void fraction range of entrance, you know pretty much what that is.

CHAIRMAN WALLIS: Just think of cleaning of the windshield when you fly through a rainstorm is quite different from the cleaning of the windshield when you're just in the air. A lot of different things going on.

MR. HANNON: We are certainly open into your insights on this.

CHAIRMAN WALLIS: What about the ZOI mapping? Is this in a similar state where -- I know there's an ANSI standard but is that just theoretical or is that concurrent with steam water experiments or is it only some sort of air?

MR. LETELLIER: It has been validated for the full range of saturation conditions for the application from which it was intended, which is structural loading.

Now we have a slightly different application. The reason it's on this list is because we are currently verifying that the application was correct. That's a very important thing to do on its own, for its own merit. The more subtle, the underlying concern is whether that model is truly applicable and whether it can be refined in any innovative way that we all have confidence in. And the extent of your interaction, we haven't even

discussed how that could be affected. It might be most effective to sit down at the table and have a brainstorming session and throw out the bad ideas.

CHAIRMAN WALLIS: But that's the beginning. We're going to be back to Peter Ford's world where there are so many questions and so few answers. It's a very bold person who is going to make a statement that this is the way to do it.

MR. HANNON: That's the challenge that we have.

Let's go to the next slide and we'll talk about that. One way we could proceed to get your input and work together.

We are prepared to interact with you informally, including coming over and sitting down in your office and going over these topics. But you've got to understand what the quality of the product that we're seeking is going to be dominated by engineering judgment in those four areas.

CHAIRMAN WALLIS: Whose judgment? It's the worst way to do it.

Usually engineering judgment is invoked when you don't know and since we're learning a lot of things you don't know, our advice is going to be, again, you're going to be very bold to make any

judgment.

MR. HANNON: We have to think that they're going to be conservative, the result that we're seeking is going to be --

CHAIRMAN WALLIS: I'm very surprised. I thought your knowledge was much better than that.

Maybe it is. It just doesn't emerge in the discussion.

MR. LETELLIER: For every step of the methodology, the entire accident sequence, there are test data available under the limited range.

CHAIRMAN WALLIS: You want to make the best use of them.

MR. LETELLIER: And that's the exercise is to make the best use of those to decide how applicable they are to the conditions of concern and apply appropriate conservatisms to that information based on that information.

You will notice that neither in the NEI baseline or the staff's position, you don't see the term 100 percent mentioned very often. That is a perfectly defensible regulatory position. We're trying to do better than that.

MEMBER RANSOM: When you say 100 percent you mean within the zone of influence?

You don't mean 100 percent of the insulation material and the containment.

MR. LETELLIER: I do mean that. How far do you want to take Dr. Wallis's criticism of are you willing to make a judgment that is confined to a compartment. If so, you're done. If not, can you extend it to the containment building, etcetera.

There's always some rationale information that you can use to make to cut off the problem, to bound it in a reasonable way. And we're not talking about refining the tenth decimal point. We're talking about proportions of 20 percent, 50 percent. We're trying to give credit where it's physically defensible.

CHAIRMAN WALLIS: Now are you going to be reaching your own independent judgment on these things and essentially writing your own guidance and comparing it with NEI or are you going to be looking at NEI's assertions and say we believe them or don't believe them. That seems to be a very different exercise.

MR. HANNON: The latter. We pretty much have got what we're going to get from NEI, with the exception of the risk-informed supplementation by the end of June. So we have received their input and

we're attempting to come to closure on these latter, big topic issues.

CHAIRMAN WALLIS: We thought that these roots of looking at alternative long-term cooling and using risk-informed approaches would get you away from this morass of all the things you don't know. It doesn't seem to be doing that.

All the risk-informed thing you offered us is just change the break size where you cut off. That's very different from saying this whole volume is so unimportant to risk that we don't need all this precision and analysis and all that kind of stuff. That's, I think, perhaps more the lines that we were thinking of.

MR. HANNON: We have two different options that can be played out. One is a purely deterministic approach which we need to have these --

CHAIRMAN WALLIS: That's the way it seems to be oriented.

MR. HANNON: It also provides for the other option which is risk-informed, which really allows a reduction in the debris, an amount of debris that's generated that has to be considered.

But you still have to go through these other issues. You still have to treat these other

issues because you still have the zone of influence.

CHAIRMAN WALLIS: I guess my inclination is to say personally you guys are the experts in judgment. I don't use engineering judgment for many things. You use it every day. So it's your problem.

MR. HANNON: All we're trying to seek here is a way that we can invite your insight to help us use our resources effectively.

MEMBER RANSOM: There are some thoughts that are very disturbing, as a matter of fact, the attempt to go to a small break size as an amelioration of this problem. It may be misconceived actually because it doesn't matter whether you blow down through a big break or a small break, you're still going to blow the same amount of energy into that containment.

MEMBER KRESS: It just takes a little longer.

MEMBER RANSOM: And a lot of chemical engineering kind of processes are correlated based on energy input to the system and what kind of debris you create as a result of the process that goes on. And I could hypothesize a situation where they'd say okay, you can blow down through a small break or large break. You're going to create the same amount of

debris. And you're going to destroy the same amount of stuff within the containment provided the process of the jet breaking up things in the containment is the same or similar in all those situations. And then a big break, small break, wouldn't make any difference.

I don't know whether that's true or not.

CHAIRMAN WALLIS: You put in the same amount of energy. It's just taken longer to put it in.

MR. HANNON: Right. And some of these processes are also time dependent. It means how long you impinge a jet is the amount you erode away from a process. So you can envision a small break might even be worse. So this thing has a lot of disturbing aspects.

MR. LETELLIER: We have never considered that line of questioning because of the finite extent of these zones and because of the finite amount of the target material. Once it's gone, it's gone.

MEMBER RANSOM: I think there are some mistakes though and not thinking, because you're boring into a fixed volume. These jets do not dissipate as fast as one thinks. It's not one shock wave that one passes through. I mean all that does is

create a little bit of entropy through that process, but then there's a re-expansion downstream of that. And it can be deflected and you're going to just get huge -- one question I would ask is what cue do you have to give below and I think you have some data on that before you quick doing stuff doing damage. And when you finally reach that state in the containment, then you can say that well, I'm not going to do any further damage, but it's -- myself and these are just based on sort of qualitative ideas in past experience, the idea of a fixed containment zone, zone of influence as such, it could be open.

MR. MAYFIELD: Could I jump in here? It's Mike Mayfield from the staff. I understand your point. We did some years ago some high fracture experiments at Patel Columbus and they're germane to this discussion only in the sense of we add some that remain reasonably stable leaks and they blew off a certain amount of insulation. We had one that someone -- it was not our intention to blow off the test point, but we did. And believe me, that double ended failure created a tremendously larger volume of debris. And I'm not talking about the rafters. It was just the insulation we blew off. We took insulation off of everything in the test loop, whereas

the others, because they were more contained, we blew off a bit of insulation on either side of the break and created a little bit of additional debris. It wasn't just the amount of energy being input. It was literally there was a rate dependence to it. And --

MEMBER RANSOM: Both of those cases had the same amount of --

MR. MAYFIELD: It had a fixed volume at 2250 and 550 psi. So it was a fixed volume, so there was only so much energy you could put into the compartment, if you will. And there was absolutely a rate dependence to it. So when we had what amounted to a double ended guillotine break, we generated a lot of debris. We peeled insulation off of everything, whereas the others were much more contained. So there is a difference in the -- the point is there is rate dependence to it that rolls into this and it's one of the things we do need to keep in mind.

So we do have experimental evidence, albeit it not for the purpose of addressing this problem. But we've got some experimental evidence anecdotally that says yes, what we're looking at --

MEMBER RANSOM: The data have to be cloned together.

MR. MAYFIELD: Those are rolled into the

BWR resolution.

CHAIRMAN WALLIS: So this is the basis of your engineering judgment. You know all these things. You have all this experience. You can make this judgment. This Committee doesn't have all this basis of your experience and is in a much worse position to say that's a reasonable judgment.

All we can do is listen to you and say well, we think you sound reasonable or not, I suppose.

MR. MAYFIELD: It would be nice if you said we sound reasonable.

(Laughter.)

MR. HANNON: That's consistent with what we're trying to show here is the outcome is we would like you to at least be aware of why we're making the engineering judgments that we make and be willing to endorse it in the final product.

CHAIRMAN WALLIS: Well, that's willingness to endorse is a bit shaky. We don't feel very confident. We could probably say we don't really feel we can endorse this but we don't also see enough holes that we can shoot you down. Therefore, we're willing to let you go ahead with whatever you want to do.

MEMBER KRESS: In the past, we've been faced with this situation, we -- they make a rule

based on judgment and when they do a confirmatory search to show that they sure enough were conservative in their judgement and if we see -- there's got to be a place to do that. If we see that they do the appropriate confirmatory research and not just let it sit there forever based on judgment, then it may be appropriate.

MR. MAYFIELD: I can't help myself. Exactly. And that's one of the reasons we're interested in this international program that Tony described. If we can turn that program to something that will add value -- it's pertinent to our --

MEMBER KRESS: It shows the conservatism of this zone of influence.

MR. MAYFIELD: That's part of the notion. You're just not going to generate those data quickly enough to directly impact what John has said.

MEMBER KRESS: Another thought was in the NEI methodology, basically boils down to this. You guys all have influence. It tells you how much to get started. You've got a distribution. The big stuff never gets there. The small stuff does. The small stuff also gets segregated by active areas of the pool. Now we question this active area thing. We've never seen a definitive calculation or test that says

active areas -- non-active areas of the pool don't get the stuff over there. So there's another area that we don't see where there's any confirmatory test. So if we were to give judgment on that part of the NEI methodology, we'd say don't allow that. But --

MR. MAYFIELD: Bruce, did any of those experiments of yours go to that issue?

MR. LETELLIER: Yes. We put in fiberglass in prototypical size distributions on the concrete floor. We introduced water and we looked at where the sedimentation paths were.

And we also did, I guess medium duration tests of 4 to 6 hours where we would collect the total amount of suspended material on a screen and try to estimate that the portion of residual that was left in place.

We compared those deposition patterns to the water velocity calculations done by CFD and also some experimental tracers in the tank to get some confirmatory correlations.

All of that evidence, it supports your intuition that yes, debris sequestration in debt sums is a possibility. Unfortunately, we don't have it into a predicted model.

MEMBER KRESS: You don't have a predictive

moment.

MR. LETELLIER: That is one of the conclusions, yes.

MEMBER KRESS: I would worry about that part.

MR. MAYFIELD: I wonder if it would be useful in trying to further the dialogue, if they're coming out of this, if there's a list of questions, issues that come to mind. You could provide that to us formally, informally, some way to help us move the dialogue along fairly quickly. Then we can take a look through the research program through the other national and international information, see if we can pick out bits of information that may help address that, probably not completely answer, but at least help the dialogue and then come back and meet with the Subcommittee and say okay, here's what we've got, here's what we don't have. And help make sure we're right with the anecdotal information. You may or may not find it compelling, but at least to make sure we're sharing with you what we think we know about the issues that you identify.

MR. HANNON: If I could supplement that too with the specifics of what we just discussed as far as the big ticket issues we have.

One of the things we might be able to do is provide you with the draft write up that we intend to use in the safety evaluation as soon as we get it prepared, informally, and then give you a chance to look at it. Would that be a constructive thing to do, to help with the --

CHAIRMAN WALLIS: I am very surprised. Mike, you're talking as if you're going to make a decision five years from now. You're going to do some research --

MR. MAYFIELD: No.

CHAIRMAN WALLIS: You are talking as if you're going to go -- what I would like to see is a very sharp analysis of what we know now, so we can make a decision based on that. I haven't really seen this very -- the question of how are our decisions buttressed by what we know now is what I'd really like to --

MR. HSIA: You'll get that next year.

CHAIRMAN WALLIS: Why isn't there a straight forward rationale, we know this, this and this and these are the uncertainties. Therefore, we make this decision. And about this debris, and so on, we know this, this and this and this. These are the uncertainties. Therefore we make that decision. Why

isn't there some sort of a process that you can go through like that?

Maybe the SER does that. Isn't that what you should be doing? Not saying these are the problems and these are the things we have to do research on and so on. That's quite fair. You often have to make a decision now. And so you make that as rational as you possibly can. You organize your evidence in a way that supports your decision.

MR. JOHNSON: Michael Johnson from the staff, NRR.

Part of what we're assuming is that in going there is on these areas where our perspective is different than what was in the NEI guidance is the rationale.

CHAIRMAN WALLIS: That is what you're looking for endorsement of. We look at this rationale and we say you've behaved in an appropriate way. I mean your conclusions are appropriate based on what you know. Isn't that what you're looking for as an endorsement?

We cannot make the sort of endorsement of some unknown unengineering judgment.

MR. LETELLIER: Because of the format of the review process, we will be doing a very detailed

line by line assessment. And unfortunately, the -- I guess to capture the methodology you will have to understand the details on that level. It's not as -- because of plant variability, because of variations of condition, it's not as simple as use 30 percent all the time. You will never have that concise of the recommendation. It has to be applied very carefully in a systematic way.

CHAIRMAN WALLIS: Is it implementable? If it's too complicated, the plants won't be able to do it.

MR. LETELLIER: There's always that possibility, but I think we've seen good examples for EDF and other plants. We know about analysis activities that are headed along the level of detail that we can be comfortable with. Nothing is impossible. It's always a cost benefit of how much effort you wish to put into it.

MEMBER KRESS: As I understand it, so far, the Generic Letter basically endorsed the NEI methodology which consists of number one, we are allowing the zone of influence, as put together in the report, and that has associated with it a faction of small, faction of large. Plus along the line where they're going to put the split factions, but mostly

that amounts to an active/inactive approval. That probably may be have to be plant specific.

The zone of influence would have to be applied only to certain break sizes. So we know what the methodology now consists of, what they're endorsing.

There's also an alternative approach called the risk-informed which I don't know exactly --

CHAIRMAN WALLIS: The alternative, you still have to make all these calculations.

MEMBER KRESS: Yes, they have to do both.

CHAIRMAN WALLIS: Right.

MEMBER KRESS: I don't know. Are we prepared to say go ahead with this Generic Letter, because it's -- it spells out --

CHAIRMAN WALLIS: We could not make the decision to stop it.

One thing is to say you shouldn't put it out until you've got these guidances and all that straightened out, but I don't -- maybe that's the advice you want us to give you. I don't know.

MR. JOHNSON: Mike Johnson. I would say the way to think about the Generic Letter is to take it on faith that we will have an acceptable methodology that either endorses or provides for staff

direction -- take it on faith we will have it at some point in time, we think by the end of September. Provided we have that, can you be comfortable with this implementation vehicle that is the Generic Letter that gets licensees out and acting on this thing and the time frames.

CHAIRMAN WALLIS: I think that is the approach we took before was when we're recommending getting it out there, because it will get things going in spite of some of the difficulties. That's what was said before, isn't it?

MEMBER KRESS: I can't see any real regulatory downside to issuing the Generic Letter. I can see where some of industry might have some concerns about it. And then not having time to do what's being asked to. But as far as the regulatory side, I don't see it raises any safety issues which is kind of -- I wouldn't have any qualms to go ahead and release it.

CHAIRMAN WALLIS: Any more qualms than we had before.

MEMBER FORD: And there is no downside at all of the fact that if you could issue this in the September time frame, it seems to me there are huge uncertainties in the technical charges. You're not

going to resolve them. You might come to some sort of engineering judgment, but it certainly won't be upholdable, if you like, in a technical audience.

Therefore, aren't you in danger that you're endorsing essentially whatever approach that you have with NEI and then you may have to change it within six months? What sort of message does that get?

If you're covered already by the bulletin 2003-01, as far as safety is concerned, why issue the Generic Letter now rather than waiting say six months, a year, until you've sorted out a reasonable number of these technical uncertainties. Why do we have to issue the Generic Letter now, assuming the uncertainties?

MR. RANSOM: It is a very difficult question to answer. It is true, we made the case, that given the low likelihood of the initiating event, given the fact that licensees are taking compensatory actions, that was sort of the case that we laid out at the time of the bulletin.

But again, we have an uneasy feeling about the fact that we still don't have, we're delaying final implementation of the regulatory fixes to these vulnerabilities and that's what you're seeing in terms

of the schedule pressures, trying to move that up, do that on a time line that is aggressive, although -- I don't know if Dave is still here, but he would tell you --

CHAIRMAN WALLIS: Has he been here?

MR. JOHNSON: He has been here earlier today. He constantly says that we should have solved this 10 years ago.

CHAIRMAN WALLIS: Or earlier.

MR. JOHNSON: Or earlier.

MR. SOLARIO: Can I add, Dr. Ford, Dave Solario, that I can share with you the justification staff, in writing, for the schedule in terms of resolving this issue being 2007. It's a two-page justification for what, why we're taking the time we're taking to resolve this issue, what factors went into our decision. We published it previously in a meeting summary. We can get that to share with you.

CHAIRMAN WALLIS: If you make it a very short letter that says simply go ahead an issue this Generic Letter and we will help out with the SER.

MEMBER FORD: That doesn't address the downside though.

CHAIRMAN WALLIS: That's their problem.

MEMBER FORD: I was thinking more in terms

of the practitioners who use this methodology which is approved --

KRESS: NEI said they are perfectly willing to go ahead with it, yeah. That's what I thought I heard.

MEMBER FORD: I thought I heard them say they thought the timing was far too rapid.

MR. JOHNSON: They did give comments on the timing, comments went to -- in the earlier version we were asking for replies on the evaluation results by April and the comment was make that September which we're proposing to adopt, September 2005.

MEMBER FORD: Yes, yes.

MR. JOHNSON: But they did not comment -- they reaffirmed, I think, the -- what's in the Generic Letter which is implementation by 2007.

And John, isn't that right?

MR. BUTLER: We're happy to go ahead with the evaluation methodology as we move forward without exception. Probably happy to go ahead with the evaluation methodology with some exceptions. Our concern is how far will these exceptions go. I mean you can take anything and make exceptions to it and have something completely different. So we're uncertain as to where we will be come September 1st or

September 30th, whenever we see this SER.

You may have an evaluation methodology that doesn't appear as much like it does now, so it's most certainly there.

In terms of the implementation of that schedule, there will likely be a number of difficulties in trying to marshall the resources in terms of vendors and other personnel that actually do the evaluations and likely some problems in scheduling the necessary effort to implement any modifications that are necessary.

All of those will have to be dealt with on a plant by plant basis. The staff has already stated that if plant comes with a schedule that is different than what they're looking for, they need to provide their justification for exceptions to that schedule. If you take them at their word, that if a plant cannot meet the proposed schedule, they'll have a justification for why they can't meet it and a rationale for why their altered schedule is appropriate.

The one thing -- these kind of analyses, but others, where as you start to close to an edge, well, gee, if it goes this way, I'll have to do this, but that way -- what's my uncertainty. If you start

cutting that too thing at some point as sort of a designer/practitioner you say look, I'm going to go ahead an err on this site, just so I can move this ball forward. If it makes a huge difference in what modifications a plant might make, then I suspect it will be a different decision, but you're not talking about cutting. So could we find something that would make a big difference. Sure. You're probably talking about things that might toggle you a bit one way or the other.

An applicant or an licensee could move forward in a way that's not going to probably cause them to have to have major changes six months downstream.

MEMBER FORD: The technical issue, the thing about the risk-informing and the NEI approach versus your approach. You can come to a compromise on that I think reasonably quickly.

ZOI issue is not going to be settled. You've given anecdotal evidence. I'm sure there's other stuff out there we don't know about. There could be a rationale engineering judgment. The one that worries me is chemical effects. Because quite honestly you're involved in an ICTF is it? ICET, that one.

I think it's a good experience and I realize it's meant to be realistic, but you may get a clear cut answer out of it. I somehow -- suppose I'm right and you come up with the wrong conclusion in two months time is when this is supposed to come to conclusion. Now what happens when you go for peer review or something like this. Maybe a year later yo come up with a whole -- this might have a bigger effect on head loss.

Now what do the plants do? They've already gone through a lot of decisions on adhering to what you've got here and say oh heck, I've got to --

MR. BUTLER: Their response would be much stronger.

(Laughter.)

MEMBER FORD: Now what do they do. When they've already had 2003 out there from a safety issue point of view, now you've got a technical issue where it could be an oh heck. And that's why I'm bringing up this question.

CHAIRMAN WALLIS: Now there may be another oh heck and I'm not sure chemical is going to be that important. But I think there's another that yes, they're going to apply the NEI guidance. Everything works fine and then 90 percent of the plants say oh,

heck, we're going to have to make a screen that's 10 times as big and that's going to cost us, X million bucks. So we're going to have to go back and sharpen our pencils and look for refinements to this analysis which are all going to be different and the staff is going to be faced with your 59 different refinements on the NEI methodology which is going to be very difficult to handle.

That's more oh heck than I would anticipate if there's going to be an oh heck.

But anyway, you can face that when it happens.

MR. MAYFIELD: Standing from the research side and looking at what Mike and John and their staff go through regularly, that's where they live.

CHAIRMAN WALLIS: Staff already has a tremendous amount on their plate to have 59 different refinements to a methodology to review and make decisions about.

MEMBER FORD: We absolutely recognize, Mike, you've got to make decisions based on certainties. We understand that. That's reality.

All I'm questioning is why do we have to rush forward now when we know we are addressing those uncertainties. It just won't be resolved in the next

three months. We know that.

So what is the rush to get --

CHAIRMAN WALLIS: My suspicion is the three months, the six months, we wont' be better off than we are today, so we might as well make our decision today.

MR. JOHNSON: I think in six months we'll still have things that we would take exception with.

MEMBER KRESS: The question is how long do you wait?

MR. JOHNSON: Exactly. And the other thing I would say is I hope and maybe I'm being a little bit optimistic and naive,but I hope there are licensees who say given the fact that there's this chemical thing out there that I don't completely understand that we're still working on, given the fact that I could take refinements, but I'm going to take the effort now to build conservatism into my assumption so I don't have to deal with any of these issues. I'm going to fix this problem one time. I've heard individual licensees say that.

CHAIRMAN WALLIS: That's part of the EDF approach too, isn't it?

MR. HSIA: The French know more than we do.

MR. BLOMART: I don't know if we did make the right decision.

(Laughter.)

CHAIRMAN WALLIS: So what happens next? This Subcommittee is going to have its own discussion. And then there is a meeting of the Full Committee.

How much time do we have?

MEMBER KRESS: An hour and a half.

CHAIRMAN WALLIS: An hour and a half, that's all we have?

MEMBER KRESS: So we have to --

CHAIRMAN WALLIS: Really concentrate on the Generic Letter, presumably.

MEMBER KRESS: Yes.

CHAIRMAN WALLIS: And not give all this other information.

MR. CARUSO: You also should be giving a report of the other information.

CHAIRMAN WALLIS: We can give a report, but we're not going to have a presentation by NEI of their methodology, by the staff, their thought -- nothing about the SER, just say it's coming. It would seem that we need about at least a half an hour, 40 minutes of the staff giving a very lucid, persuasive arguments about the Generic Letter and why it's

appropriate at this time. And in the final form, we're going to have -- and then we need a brief discussion about these other matters. And then probably, the Committee is going to have all the kind of questions we have and more because there are four people on the Committee that are going to bring perspective we don't' have which may cover a lot of other ground.

I would allow a lot of time for committee discussion.

And the subcommittee may draw up the letter which is quite different from what the full Committee may want to draw up.

MEMBER KRESS: That happens quite often.

UNIDENTIFIED SPEAKER: Do we collectively feel like we understand the sort of key issues the subcommittee raised, so we can go back, articulate those and hopefully provide information? Are we pretty comfortable, do we understand?

CHAIRMAN WALLIS: You might want to read the transcript.

MR. HANNON: We didn't get a clear signal. I take it from the body language that you would be willing to receive the SER on the tough issues as we get them draft informally? That will be our plan

then.

CHAIRMAN WALLIS: And I think probably some of us are going to take a hard look at this NEI document, the most recent one which is not in its final form, is that right? It's very different from the one we reviewed before.

MR. HANNON: With the exception of Chapter 6 --

CHAIRMAN WALLIS: Right. So we're ready to end the formal part of the meeting. I think it's been very good. I mean the participation, the willingness to discuss openly has been very good.

I'm not going to say that I see exactly what we're going to do, but it's something that we'll deliberate. Anyway, have gotten a lot of help from you in helping us thing about the problem.

Anyone have anything else you want to say? It being 4:30, we'll end this, we'll recess, is that the right word. We'll adjourn.

(Whereupon, at 4:31 p.m., the meeting was adjourned.)