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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FUKUSHIMA SUBCOMMITTEE

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WEDNESDAY

AUGUST 15, 2012

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Stephen P. Schultz, Chairman, presiding.

SUBCOMMITTEE MEMBERS:

STEPHEN P. SCHULTZ, Chairman

J. SAM ARMIJO, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

MICHAEL L. CORRADINI, Member*

HAROLD B. RAY, Member

MICHAEL T. RYAN, Member

WILLIAM J. SHACK, Member

JOHN D. SIEBER, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

NRC STAFF PRESENT:

ROBERT BUDNITZ, Lawrence Berkeley National Laboratory*

NILESH CHOKSHI, NRO

RAVINDRA JOSHI, NRO*

ANNIE KAMMERER, RES

STEVEN A. LAUR, NRR

*Participating via telephone

T-A-B-L-E O-F C-O-N-T-E-N-T-S

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

(8:30 a.m.)

CHAIRMAN SCHULTZ: I'd like to call the meeting to order. Good morning. This is a meeting of the Advisory Committee on Reactor Safeguards, Fukushima Subcommittee. I'm Stephen Schultz, the Chairman of the Subcommittee.

ACRS members in attendance this morning are John Sieber -- Ja**ck Sieber, Dick Skillman, Dennis Bley, Harold Ray, Sam Armijo, John Stetkar, Michael Ryan, Bill Shack and Charlie Brown.

The purpose of this meeting is review and discuss draft interim staff guidance on performing seismic margin assessment in response to the March 2012 Request for Information Letter. The Subcommittee will hear presentations and hold discussions with representatives of the NRC staff and other interested persons regarding this matter.

The Subcommittee will gather information, analyze relevant issues and facts and formulate proposed positions and actions as appropriate. The Subcommittee will report its findings in an upcoming Full Committee meeting, but at this time has not yet decided on whether to issues a letter report on this matter.

The meeting this morning is open to members of the public. The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register. We have received no written comments or requests for time to make oral statements from members of the public regarding today's meeting, but there will be an opportunity at the end of our discussions for public comments.

Derek Widmayer is the Designated Federal Official for this meeting.

A transcript of the meeting is being kept and will be made available on the web. I understand that some of the participants in today's meeting are on the bridge line. Michael Corradini, ACRS member, is on the bridge line.

It is requested the speakers first identify themselves and speak with sufficient clarity and volume so they can be readily heard. Thank you.

We'll now proceed with the meeting and I call upon Mr. Nilesh Chokshi, Division Director of Site Safety and Environmental Analysis in the Office of New Reactors, to open the proceedings. Nilesh, thank you.

MR. CHOKSHI: Good morning, Dr. Schultz

and thank you for an opportunity for us to come and talk to you about this draft ISG while the work is in progress. I think this time will be, you know, we can take into consideration before we have a rush to issue the position out, so I think that's good.

CHAIRMAN SCHULTZ: Thank you.

MR. CHOKSHI: With me at the table is Annie Kammerer from the Office of Research and she's been helping on the 2.1, 2.3 activities on the Fukushima. And also, by phone, Dr. Budnitz and Dr. Ravindra are participating. And I guess I'll check, Bob?

DR. BUDNITZ: I'm here.

MR. CHOKSHI: Ravi?

MR. JOSHI: Good morning, I'm here.

MR. CHOKSHI: All right, so I have my backup.

CHAIRMAN SCHULTZ: Thank you for being present.

MR. CHOKSHI: So they are here to participate in this morning's discussions. My plan is to start the presentation with a brief discussion of why we in the first place considered using the NRC-SMA for this particular application. Then, you know, in response to particularly 2.1 50.54(f) letter.

Now I also want to go over a brief background of a little bit of history of the NRC-SMA in order to explain why certain announcements are needed and what really caused that ISG to come about. The need for the ISG.

MEMBER STETKAR: Other enhancements are not needed.

MR. CHOKSHI: Yes, you are right. And then most of the focus on the presentation is going to be on the technical positions. And then I'll go over most of the key technical positions and I selected three examples to discuss in more detail.

And then what I'd like to do is end the meeting with, tell you what the next steps are, what the schedules are. So put everything into context. So if you can go to the next slide. Oh, this is it. Okay.

So I think let me start with why did we include, in the first place, this option of using what we have been calling NRC Seismic Margin Analysis. And when I go over the background I think it will be a little bit clearer what this matter is about and how it has evolved.

But basically the 50.54(f) letter considers use of either Seismic PRA or margin method

adequate for the plant evaluation. For the plants they have to conduct the evaluation because they don't pass some of the screening criteria.

Also the 50.54(f) letter talks about that SPRA is suitable for all conditions. And then the NRC-SMA is suitable in certain conditions. And it talks about what are those conditions.

MEMBER SHACK: Have you quantified those any further?

MR. CHOKSHI: We have, yes. And we have done more work, we had a meeting with the industry. We are actually coming together. And there is a meeting tomorrow, we're going to discuss more.

MEMBER SHACK: Is that going to be in the SPID or whatever we call that thing?

MR. CHOKSHI: Yes, it will be right here. And I think we are converging on some of the things on that.

MEMBER SHACK: Are you going to tell us about that today?

MR. CHOKSHI: I hadn't planned, but I can give you brief, you know, if you like. But it's pretty much what you have heard before. But we can go over that.

CHAIRMAN SCHULTZ: Nilesh, details that

you might provide about, you mentioned that the process that has been developed by the NRC is coming together already with comments from the industry. And if you can share information that has come forward from the public meetings that you've already held prior to the public and review of this plan, that would be good.

MR. CHOKSHI: Yes, and the project manager is here. So what we have been doing that when we get this information, this just came yesterday, and this is a part of the SPID I was going to show you when I talk about SPID. But we are putting this in ADAMS to make it publicly available to everybody. And I think at least we can go ahead and provide the ADAMS, the number to the ACRS. So you'll see what has been discussed, all the things that, we can make sure that you have it.

MS. KAMMERER: And understanding it's still a very early copy. What we're doing is in preparation for each of the public meetings, we're getting the document but it's going to continue to be filled in. Basically all the topics are there but all the sections haven't been written yet and you'll see that when you look at it.

MR. CHOKSHI: Yes. And when I talk about

it, you know, that's why I put in presentation specifically discuss. I'll explain how this interacts with everything we do. And then I'll talk more about it. Some of the positions are closed for all practical purposes and in some cases we have actually endorsed some of the technical issues.

Other one is working the progress. At every meeting we sort of making progress in each of the --

CHAIRMAN SCHULTZ: So as you go through the presentation, if you could identify those categories that would be helpful.

MR. CHOKSHI: Yes, I'll do that.

CHAIRMAN SCHULTZ: Thank you.

MR. CHOKSHI: So coming back to this, I mentioned that we talked about in the letter that the announcement needs to be reviewed if somebody wants to use NRC-SMA. The NRC method is a fault space-based approach. And that was one of the very clear, I think, distinction made in the letter that the approach has to be fault space-based approach and specifically said that the --

MEMBER BLEY: Nilesh, I want to ask about that, just because --

MR. CHOKSHI: I expected --

MEMBER BLEY: Personally, if you're going to do one of these, I don't see why you don't do the PRA itself. But, having been around when both of these methods arrived, in fact being involved in one of them, I haven't seen everything that people have done with it since. But I kind of wonder what staff thinks people did to come up with their success paths.

Actually they had plant-specific PRA, internal events PRAs and use the fault trees and event trees in a more complete model than actually the reduced models in the other approach. So the argument seems a little fuzzy to me.

MR. CHOKSHI: I think part of the problem is more that if you need to extend the insight for margin to any kind of risk insights, when we were going to site specific screening process in GI-199 we found that it was extremely difficult to do any of that kind of extension. And which we would need I think in order to make the ultimate decisions about what are we going to do with this information in part of the Phase 2.

So I think we felt that an option is available but it should be able to then, if you need to extend to get risk insights, or for example if you want to do some more like cost/benefit or some

regulatory analysis, you will have to do that. And we found that very, very troublesome to do.

MEMBER BLEY: Back to what Bill asked. Are you getting much from industry at this point?

MR. CHOKSHI: No, they actually, I think the question you asked in the last, because what is happening, because of the type that they are asking certain simplifications in the PRA process.

And I was going to go through them. And we are putting certain enhancements to cover the right scope for the things you have mentioned that, you know, EPRI had 72 hours. NRC whenever they went over the recent revisions didn't.

So we are including that now, because when NRC matter was developed and the thinking has evolved since then. So you will see that both of these approaches are coming very, very close to each other. And I think, and I'll speak from what I've heard in discussions. You know, this is not industry's formal, but at this point a lot of people are thinking SBR.

MEMBER BLEY: I would think so. It just doesn't make sense if you do --

MR. CHOKSHI: And that's how, you will see as you went on. The problem, I think, it's not really doing the SPRA RS margin. It's the availability of

expertise to do the response analysis and fragility type of analysis. That's what the bottom line is.

MEMBER BLEY: I want to flag something for going ahead and I want to mention it. John Stetkar first triggered this in my head yesterday. When the HCLPF idea was developed, it was you picked the value low enough that you're really certain that you won't get any damage at that level, even though it's low probability. It's close to certainty I think.

And if you met everything with the HCLPF you were very confident. But now we're talking about taking HCLPF as an anchor point and hanging an uncertainty curve onto that. Well when you start with the median, which is what you did in the PRA, and put the uncertainty on it, the amount of conservatism in that is hard to judge but you try to pick the best uncertainty band. But it's the interplay of that curve with the hazard curve that tells what risk is and it might be lower or higher as you change that.

When you anchor to the HCLPF and then put the uncertainty on it, the wider the uncertainty, the lower the risk no matter what. It seems an intellectually indefensible way to approach this.

MR. CHOKSHI: Well in fact what you will see, that's one of the positions, which position is

the user CDFM to anchor the fragility. And then what we are talking about that when you come to the end of the analysis you want to take your dominant contributors and look at it from a medium capacity point. Due to the fragility type of --

MEMBER BLEY: But if you haven't calculated the median, the median's and artifice of whatever uncertainty you tagged on that's artificial.

MR. CHOKSHI: That's why we want to separately do a separate calculation for those components.

MEMBER BLEY: I'm still uncomfortable. I want to hear more later, because if you take median capacities and median hazard you get no risk.

MR. CHOKSHI: Yes, I agree with you.

MEMBER BLEY: In doing it, because that's by design.

MR. CHOKSHI: And that's what we are talking about. That, when it come down and you have accident sequences and then you have skewed confidence when you know that those are the controlling. You want to go back to characterize those uncertainties.

MEMBER BLEY: Actually developing the median.

MR. CHOKSHI: Yes, that's what I'm talking

about.

MEMBER BLEY: Ah, okay. Well that's a different story. But it sounds kind of --

MEMBER STETKAR: If you use this approach and you inappropriately characterize the median and you develop those sequences and you do any type of modification, you may have missed your dominant contributors because they were inappropriately small. So how do you define those dominant, you throw around the words dominant contributors as if it's a de facto truth. They may not appear.

MR. CHOKSHI: Yes, and I think one of the things, and if you look at this, that industry is doing some of the studies to support that can you make those kind of, you know, can you show that there is no change when you take the PRA and do it both ways basically. And see, they're not going to do that for everybody, but as a supporting study for the position.

MEMBER BLEY: The HCLPF idea was to gain some confidence that even with very, very low capacities you're okay. And now using that as an anchor point for the distribution just doesn't seem a reasonable position. We'll have to see what industry does with it but it's --

MR. CHOKSHI: And the reason, what drives

that for them to do that, is that a lot of, you know, many people can't do the CDFM type calculations, because it's very prescribed procedure, right. And the fragilities we have seen that unless, it gets a lot more complex.

MEMBER BLEY: But it's probably okay for getting HCLPF, for having a high confidence, low probability. But it's just the wrong place to anchor your distribution. It might not be the one percent level, it might be something quite different.

MR. CHOKSHI: But Bob Kennedy has done earlier studies, you know, looking at the difference of beta values and things. And I'm shocked that as you suggested, neither beta is bad if you anchor your, in the sense that you are --

MEMBER BLEY: Let's see what you're going to do. If you use minimum betas then I'd be much more convinced. But you're not recommending that, you're recommending kind of a middle level uncertainties parameter.

MR. CHOKSHI: If you go back to taking the square, I think we're looking at 0.3/0.35 type of values.

MEMBER BLEY: Yes, that's just kind of a middle value.

MEMBER STETKAR: That's sort of a middle level if you look at hundreds of actual fragility analyses that have been done for thousands of actual compliments. 0.35 is sort of a middle level. They range from about 0.2 to about 0.6. So it's kind of a middle level. It would be grossly optimistic for things that would have a beta-C of 0.2. It would be conservative for things that have a beta-C of 0.6.

MR. CHOKSHI: Yes, well I think that's, again, this the sort of ongoing discussion with industry. We are waiting for some of the results to come back. But that's a good input.

MEMBER BLEY: And you'll get more about that if it stays like this.

CHAIRMAN SCHULTZ: Nilesh, if we could hold right here for just a few moments. The recorders need to make a swap out here. And so I'm going to call a recess, it may take about ten minutes.

MR. CHOKSHI: Bob and Ravi, I think if you also like to address some of this, please.

CHAIRMAN SCHULTZ: But think about it or prepare for it now and we'll come back into session in just a moment.

(Whereupon, the meeting in the above-entitled matter went off the record at 8:48 a.m. and

resumed at 8:57 a.m.)

CHAIRMAN SCHULTZ: I'll call the meeting back into session now, following a short recess.

MR. CHOKSHI: I think the last we left, Bob, do you want to add anything to the discussion about, you know, that we were having about use of CDFM and how we are looking at the SPID position.

DR. BUDNITZ: Well, this is Bob Budnitz. And I've been a consultant to Nilesh and Annie and the Research staff right along on belt with this. And I don't mind saying that when SMA was invented in 1984 and '85 there was an expert panel that I chaired, so that was way back in the last millennium, if I must say.

Now the reason for allowing CDFM for the bulk of all the seismic capacities, the conviction that if we required fragility analysis method, which is the separation of variables method, done, there isn't enough talent out there in the world to do it.

We just, there's a lot of experience that tells that analysts, and Ravindra's on the phone and he's a premier tech. A whole lot of experience has told us that you just can't turn the fragilities analysis separation to a very large number of people without -- but we have more confidence with the

ability of analysts, of a large number of analysts, to develop a HCLPF value directly using the CDFM method directly.

MEMBER BLEY: Bob?

DR. BUDNITZ: Let me go on. But the crucial point is that in most seismic PRAs, that I've seen, in fact, in all of the seismic PRAs that I've seen, there's never more than a handful of components that I would say are the leading components in, let's say the seismically weakest ones. There's never as many as ten that are the weakest ones. It's typically more like a half a dozen or sometimes even three or four.

And what we've said is that we want for those leading components, the weakest ones in the HCLPF space, we want some of those re-analyzed using the fragility analysis method. The separation of variables method. And then for the many, many others, stronger, stronger enough to contribute, we are comfortable with letting the CDFM method for the HCLPF stand as sufficient. Okay?

MEMBER BLEY: Bob?

DR. BUDNITZ: Yes.

MEMBER BLEY: This is Dennis Bley, give me a second, Ravi, and then you can come in. Our point

wasn't really arguing about the HCLPF. Although I think it's not the best way I think it's perfectly adequate for what the purpose of the HCLPF is.

Our discomfort comes from then taking that HCLPF and hanging a distribution on it. You know, if one looks at the weakest things from the point of the HCLPF that's probably a pretty reasonable thing. But if one uses that as an anchor point, hangs a distribution that was developed to go abound the median onto that kind of artificially picked HCLPF and then uses the results of an analysis that involves that with a hazard you're taking a bit of a chance.

DR. BUDNITZ: Let's agree. In other words if you take the HCLPF value, you put on a generic beta sequence then you do a convolution of that with a seismic hazard, you do not have a very accurate estimate of the risk per year of that unit getting in trouble.

MEMBER BLEY: Yes, your mean could be well off, you don't know for sure.

DR. BUDNITZ: Exactly correct. So you shouldn't be doing that convolution. For those ones, that I'll call the lowest lying ones, in this guidance we're going to insist -- And by the way the industry is onboard on this. Was with us 100 percent on this.

And Greg Hardy too. That we want them to do the fragilities analysis method that gets to the median value and does the thing properly. And then you can take that and do the convolution with the seismic hazard.

MEMBER STETKAR: Bob, this is John Stetkar. When you say you'll take the lowest lying ones, is that based on HCLPF or is that based --

DR. BUDNITZ: Yes.

MEMBER STETKAR: Well that's the way I read the ISG. The ISG seems to say that you infer a median and you use that value with your seismic hazard. Run it through your scenarios and then determine what your so called dominant contributors are and then go back and re-look at those. So that's a little different. Maybe I --

DR. BUDNITZ: I hope that that isn't how it, I don't think that that's what we're writing. If it is either you've got an earlier version or the thing that I've got isn't, I --

MEMBER BLEY: Well I hope you have a newer version. That's what this one says.

MEMBER STETKAR: It's at least the way I interpret it. If there's a different interpretation and we can get educated this morning that would be

good.

DR. BUDDNITZ: I think I understand.

MR. CHOKSHI: Yes, I think, Bob, that we are talking about two things here. What is intended for SMA and what's industry position also in conducting SPRA.

DR. BUDNITZ: Oh no, we're talking about SMA here. Okay.

MR. JOSHI: This is Ravi. Good morning. Hi.

CHAIRMAN SCHULTZ: We hear you, Ravi.

MR. JOSHI: Okay. Now, important is the CDFM calculated value as calibrated in a -- (telephone line cuts out) combo to see whether we get a different value if we do a -- (telephone line cuts out) analysis. The answer depends on the --

MEMBER BLEY: Excuse me, Ravi. Ravi, you're cutting out. Ravi, we can't hear you, you're cutting out. Can you get to a better phone?

MEMBER STETKAR: We're getting about one-third of your words in every sentence.

MR. CHOKSHI: Yes, you need to be on a land line, I think.

MR. JOSHI: I can hear you well.

MEMBER STETKAR: We can't hear you well.

CHAIRMAN SCHULTZ: It breaks up on our end.

DR. BUDNITZ: Oh, by the way I think I can answer Stetkar's question while he's doing that. If you have an ordered list of HCLPFs and you put a generic beta-C on them, medians you get are ordered in the same order. That's for sure. Now you shouldn't be using them to convolute with an hazard for sure. If you do it that way the order has to be the same, because the beta-C is generic.

So for the purposes of trying to decide what you're ordered list is of lowest ones, one, two, three, four, five, six, seven, the HCLPFs will line up, medians will line up.

MR. JOSHI: This better?

DR. BUDNITZ: By the way but you shouldn't be convoluting that with a hazard to get what I would call CDFM.

MEMBER STETKAR: So we seem to be pretty well in agreement on that.

DR. BUDNITZ: But we're talking here about SMA, the seismic PRA is a different discussion.

MEMBER STETKAR: Ravi, you want to try again?

MR. JOSHI: Yes, can you hear me now?

MEMBER STETKAR: So far.

MR. JOSHI: The CDFM calculation that provides HCLPF value has been calibrated with using the fragility analysis. We have done a number of examples to see if similar HCLPF values whether we do this CDFM or the fragility analysis. The answer was we will, at about the HCLPF value. And that HCLPF value from a split -- point percent probability of failure.

So the approach is, the CDFM HCLPF value is taken as one percent probability of failure and then you can develop, using generic -- you can develop a (telephone line cuts out) curve. The anchor --

CHAIRMAN SCHULTZ: Ravi, you're breaking up again. I'm not sure what the solution is, but there is a technical issue here with the communication line.

MR. JOSHI: Can I hang up and call again?

CHAIRMAN SCHULTZ: Sure. Are you on a speaker phone?

MR. JOSHI: I'm on a speaker phone.

CHAIRMAN SCHULTZ: A handset might work better.

MR. JOSHI: Is this better?

CHAIRMAN SCHULTZ: No, that's not better.

MR. JOSHI: I'll hang up and call again, okay.

CHAIRMAN SCHULTZ: Okay.

MEMBER SHACK: Just reading in Appendix A there's a discussion that goes on here about this composite method. One disadvantage is that the assumed composite variability may give conservative estimates of seismic CDF.

Another instance it may lead to erroneous conclusions as to the dominant risk contributors. Then it goes on to say, for those SEC that are determined to be the dominant risk contributors, better estimates of A, M and B should be developed.

So it tells you you might get them wrong but then go ahead and --

MEMBER BLEY: But it's not just conservative, they could be the other way. They could be optimistic.

MEMBER STETKAR: What they don't say is they could be optimistic.

MEMBER SHACK: But it says it gets to erroneous conclusions and then it tells you how to use them.

MEMBER STETKAR: That is certainly true.

MR. CHOKSHI: I think, I fully agree that

we know in a review, people making the larger beta it may, but when you enter your fragility to HCLPF --

MEMBER STETKAR: That's not true. The most conservative beta to use, if you're going to use this as a screening process, would be the smallest beta that you've gotten from anybody doing real fragility analyses of SSCs for a real plant. Something on the order of maybe 0.2, 0.1, I've seen 0.15s for some analyses where things are not very rugged and there's a high likelihood of failure.

MR. CHOKSHI: I mean most of the things I've seen are sort of 0.3 to 0.6.

MEMBER STETKAR: Because most of the things have been done generically by the same people who use the same generic beta-r and beta-u, that's why.

MR. CHOKSHI: No but I think, yes, the discussion, that just comes as taken for what we are developing with both PRA and SMA. And I was going to talk about that. And this one of the factors why these things are coming closer, because they're talking about certain things using the PRA space and also similar conceptions of margin space. So maybe if I go on we can see all of that.

MEMBER STETKAR: We'll probably come back

to it.

MR. CHOKSHI: At least we'll come back here. So I think probably we are done with that slide. I cannot do it here. All right. This is how the draft ISG has been divided into these sections. Trying to follow the sort of formats we have been following for the ISG.

And I'm not going to go each of the sections which are in the ISG, but I want to talk about a couple of things in detail. Purpose, background and our staff position. And then I think, I'm sure you'll have questions related to other things. But I was going to focus on some of the key aspects of the ISG, but that's how it's laid out.

Purpose. Okay, the purpose of this ISG I think Bob Budnitz mentioned and I mentioned in my introduction. The NRC-SML has been developed in early 80s. There has been a number of other things have happened since then.

Also for this particular specific application I think we dealt ourselves special circumstances, which of I'll explain in my presentations. So the guidance is needed for that purpose. And I will go into more details of why the guidance is needed.

But the specific purpose of this guidance is to give guidance on using NRC-SMA for the purpose of developing information requested in 50.54(f) letter. And this guidance is intended to used for that purpose only at this time. Okay, because we have made, as you will see, that certain decisions are made which are not necessarily, you know, if you're literally compatible with what standard says or some other thing says. But for this applications we have created certain positions.

So this is, it should not have implications for other things. You know, for example, for the new reactors it is clear this should not be confused with ISG-20, you know, this is not for that application. So I think we just wanted to make sure the users of these are, you know, and this has not been misapplied, because some of the things we are bringing up, you know, these things are --

MEMBER SHACK: I would say anytime you have to apply that kind of codicil to guidance, it tells you you're stepping into deep doodoo.

MR. CHOKSHI: Well this is, I think if you're talking about this issue if you have to do 30 or 40 applications at the same time and you're talking about limited resources you want to do the right

things. But we're trying to find the best way but you can still get to the objective for that particular application. But I don't think really to say they should be used for everything.

MEMBER STETKAR: Nilesh, make sure I understand the basic rationale here, because there were a couple of places in the ISG where that second bullet is emphasized. You say that the DC/COL-ISG-020 is more appropriate for new reactors. That implies it's less appropriate for existing reactors. Is it strictly the resource associated with fragility analyses? That's the only issue?

MR. CHOKSHI: To me that's the biggest issue. I mean, they in fact, in very initial discussion we were talking about using ISG-20 for this also. But in that case there is no option. ISG-20 is an option when you don't have a hazard information, basically. Here you have a hazard information. So to say that ISG-020 is an option to me doesn't make sense. And the next step is to go on, in regard to your answers.

So I think for this one we thought for some of the low seismic hazard site this is why a bold approach, but it has to be fault-based. Okay, let me go now, above here on the slide on the background on

NRC-SMA, I'm sorry I haven't been announcing where I am, so you and Ravi can both follow. So I'm on the background slide.

Let me just repeat, because ACRS has a lot to do with SMA in some sense. I think it is like, as all of you know, in the late '70s and early 80's the NRC undertook a very systematic, comprehensive program to look at the sort of seismic safety in its totality.

There were a lot of issues, particularly in when in `60s and mid `70s the seismic design processes became involved. There were controversies about positions in SRP. Some of the people were saying some of the things are very conservative. And there were issues that it was not conservative.

So the SSMRP looked at very comprehensively at the question of the conservatism, the various steps and also the level of the seismic risk analysis matter. You know, a lot of that the people involved also developed the industry side and were the same people, Bob Kennedy and a number of people were starting, Ravi also was part of that.

So the SSMRP had a very comprehensive look at that. And while that was ongoing, there was a discussion about -- and particularly Professor Oakland, I think, and the ACRS was concerned with

that: is there sort of a cliff? We haven't really answered the question beyond design-basis margin. Can we quantity and can we answer.

So in response to that ACRS concern the NRC found an expert panel, which was chaired by Bob Budnitz, and so Bob is much better to talk about this but I'll continue with my discussion. And so they found the question, how do we define, come up with this, what is the actual seismic margin of the plant, beyond design-basis.

The deliberations, the panel included Bob Kennedy, Alan Cornell, Shinozuka and lot of those experts at that time. And we had talked both in terms of the probabilistic and had work with, particularly in the structural area with reliability type of concepts.

And so this panel then got together and they basically said that an easier way to address this question is not come up with **the** margin that you can answer that question, but it's to add sort of a define an earthquake level which is higher than the design-basis, and then measure your plant against that.

And so then, I think, as those two sub-bullets show, find the plant capacity to resist that -- high confidence, low probability of failure to

resist that level of earthquake. And so they defined this HCLPF: high confidence, low probability of failure. So that's been the two major approaches. You know the key concepts came out of that deliberation.

And that's how the method of analysis is structured around those two basic ideas. That you define a DB-level earthquake or seismic margin earthquake, which is higher than the, you know, and you'll see about that in the applications that concept has your, part of that in terms of you talk about screening, it's an important step. So that's why we --

MEMBER STETKAR: Are you going to talk a little bit more in detail about that screening or this --

MR. CHOKSHI: Yes, I'm going to talk in a lot of detail about that.

MEMBER STETKAR: Okay, thank you.

MR. CHOKSHI: So that, to me, it's a key step on this whole, you know. So the NRC-SMA, as opposed to the EPRI and things, was basically the panel used the insights from the PRAs, which were available then and I think that I can rattle off some names, Zion and Indian Point and Limerick, Mill Stone,

all of those things which were available at that time.

MEMBER STETKAR: And that was all of them, there were about five.

MR. CHOKSHI: I think you exhausted my, right. And then they also basically retained the false based approach. They focused on selected functions and the thought was that if you look at dysfunctions you will capture most of the structure systems and components you want to look at whenever. But you've covered most of the front line and support systems, which allowed to simplify the logic structure quite a bit.

And I think, Dennis, you talked about when safe shutdown and was the old approach with NRC, that was right. So I'll talk about more on that. And another thing I think at the same time was this screening tables based on the available test data calculations done for the fragilities.

Earthquake experience played a big part on that. That you could look at certain, and because we are defining a specific level of earthquake, you could use that experience, coupled with the level of earthquake, to eliminate certain components, eliminate certain conditions. Okay, so that was allowed to use the scope of the analysis, so they were both.

And then I think the last bullet is that we have been talking about the Min-Max approach. When you do the HCLPF how you quantify sequence level HCLPF and ultimately your plant level HCLPF. And I'll talk more about that. There is also somewhat an evolution, little bit about that as well.

The matter was published in the Expert Panel Report, 4334 ('85), followed by some detailed guidelines on how to apply that. And then also there is more system insights, in particularly the BWR in 5076.

And this was actually applied in the Maine Yankee. Maine Yankee had actually a licensing issue. Their design-basis there was a question about because of the -- if I remember right, GAAP and earthquake, the people knew about them after the plant was licensed and whether they should have been considered in the design basis.

So the Maine Yankee volunteered to have a trial application for the NRC-SMA, because at that same time they can also answer the question, is design basis what the plant built on. So that's why that was applied. Just really a trial plant, and I was involved quite a bit and, in fact, wound up writing an SER for addressing that licensing issue.

So that was the application and the other applications of NRC-SMA, when industry did Hatch for their success path approach, NRC did the system review. And some of the insights came out from that also. So that is my, the guidance of the NRC-SMA is sort of scattered in some number of documents. If you want to systematically understand how to apply today you'll have to go to a number of documents. And that's -- Bob, I'm going to the Slide, Reasons for Enhancements.

DR. BUDNITZ: Yes, I'm watching it, I think out here we've got it. I think Ravi probably does too.

MR. CHOKSHI: So that is one of the reasons for why for why we want to have ISG to try to bring in all these different things, help, and just historically in one place. So the people understand that.

And second, the other big reason is the scope of the analysis to respond to a 50.54(f) letter has to be bigger than what was in the original, you know, the Group A function zone. And I think one of the things is that we need to extend the time to look at more, going down to the stable shutdown.

Also the references. You know, the things

we talk about, the fragility analysis and the basic principles that have not changed, but there has been some advance made on particular aspects of those matters. So we want to capture that people use that and don't rely on what's referenced on the old documents. Because then it's also bringing, and then also you want to, as I have been mentioning, these industry positions we are working on, which, its primary driver has been talked about in context of SPRA but a lot of those are applicable here. So we want to make it consistent.

So that's the reason for, and that's why this ISG is bigger. I initially thought that we'll only talk about enhancement. But as the things have progressed, it has become clear that we need to put it in one place. And so we have tried to cover all of the major elements of the matters.

MEMBER SHACK: I found it difficult even to track down those old NUREGs. I've never found the BWR one, I've got the PWR one.

MR. CHOKSHI: Yes we actually, I think between Bob, me and going back to original authors we have been able to scrounge up all.

MS. KAMMERER: We're having everything that's referenced, we're finding, getting scanned and

getting put into ADAMS.

MEMBER SHACK: Oh good.

DR. BUDNITZ: Anybody that wants 5076 now I'll email it to you.

MEMBER SHACK: Can you do that, Bob?

MS. KAMMERER: We found that at least one shares a NUREG number with another document as well.

DR. BUDNITZ: Who wants it?

MEMBER STETKAR: Send it to Derek.

DR. BUDNITZ: I'll send it right now. I found a copy in my basement and scanned my personal copy.

CHAIRMAN SCHULTZ: Thank you, Bob.

DR. BUDNITZ: Don't laugh, it may be the only one around.

MR. CHOKSHI: Okay, so we're going to move on to the next slide. And then we're going to start talking about the staff positions on technical issues. And basically the technical issues we have divided into the five categories, as shown here.

And I'm not going to read the slide, but the way the ISG is structured that those five areas are the scope of the SMA. Things related to the ground motion and the responses of structures and systems and confidence. How do you add those, you

know, the system analysis part, the fragility and capacity parts which includes fragility method, CDFM method.

And then finally integration. And then documentation and peer reviews are in a separate section. Sections 5 and 6. So that's sort of each element that we have grouped together.

And my presentation is not going to necessarily going to follow, you know, follow this because what I've done is tried to pick up sort of key positions are make them clear, because I think otherwise I would have to restructure my presentation very drastically and I have the slides available. But I think it can raise the, you know.

But before I do that we'll be talking about the SPID approach and I sort of want to describe what it is. The SPID approach is when we, as a part of the 2.1 letter, if you look in the letter it specifically says that the staff and industry will work together to develop implementation guidance by November of this year.

And that process, that is twofold approach. Industry will develop certain industry positions, working with the staff, and they will submit to the staff and the staff will endorse it.

The second part is that where there are specific things which staff would like to see to be applied or there is a need for staff interim positions, staff will issue an interim staff guidance.

So in the seismic area there's a mixture of both. The only ISG actually is this one. And the rest of the things we are going to work for the Screening, Prioritization and Implementation Details Guide. So that's what the approach is to address the guidance issue.

MS. KAMMERER: Just to make one point, is that the topics, I think the next slide is the 11 topics that are being discussed, those are topics that were actually identified by industry as those that they felt that they needed additional guidance on.

And so that was the source, so they're not a comprehensive set of guidance, they're a little bit patchy. But it was something that they really felt had an opportunity to either go awry or that they wanted input so that we could get a more consistent response.

MR. CHOKSHI: Yes, and I think, I'm going to go to that list of issues.

MEMBER STETKAR: Before you get to specific issues, are we going to see that document?

MR. CHOKSHI: That document is actually, versions of them are already available in public. We can make sure that you have, it's an evolving document.

MEMBER STETKAR: No, but I mean if it's going to be published in November they tend to be in a state of flux until they're published. So we've had that experience seeing things --

MR. CHOKSHI: It is. Every meeting, before the meeting they give us the new version.

MS. KAMMERER: Right. So when we started out back in April the very first thing that they did was actually just come in with a set of items. And so we've gone through a process up until the last public meeting, which we've been doing about one a month, where we were just working from a series of position statements and working through those positions statements.

As of the last meeting we managed to resolve, come to agreement, on a number of them to the point where they felt like they could actually then put together the first draft of the document, which is what we will have available for you. Understanding there's still sections which are empty.

MR. CHOKSHI: Yes, and you will see the

example, you know, I have a specific example of how we started, initiated, this process and where we are.

MS. KAMMERER: But we can also provide you information from the public meetings, because there will be some gaps in the SPID document on some of the positions because it hasn't been written yet.

MEMBER STETKAR: I understand the state of flux. What I was asking is will the ACRS Subcommittee have the opportunity to give you comments on that document when it develops some sort of stability and before it's published? I draw the analogy to the FAQ process that went on during the fire analysis, where it just seems very similar to that.

And in many cases, you know, fairly substantive technical issues are resolved in that forum. And I think it would be useful for us to see that document, when it becomes more stable, because it's not useful to see something that will change at the next meeting. But in some sort of timely fashion before it's published.

MR. CHOKSHI: Yes, I think we'll take that back, then we'll schedule it and get back, when it looks like fairly stable and then we can come.

MEMBER STETKAR: I mean that sounds like October, which is only three months away.

MR. CHOKSHI: Now I'll tell there are a couple of things which have, and let me come to that, we already endorsed because of the timing. But I'll talk about each of those, one of the things. Because that will have a big impact on certain things.

Okay so now let's specifically talk about the 11 issues. And the issues came about sort of a joint discussion. Because if you look at like Number 2, Hazards. Okay, use of existing site conditions. In doing the hazard analysis the local site response analysis is a key step. And how do you get some of the data in an existing site you can build, you know, do the bootings under the plant and stuff.

So we had extensive dialogue and industry did supporting studies and gave us a lot of, there was extensive interaction. They developed the process, we reviewed, we give them feedback and modified it. But at this point it's essential integrating for performing hazard analysis so we settled that first.

So the industry came back one or two weeks back on that, based on our discussions, they finalized their approach and then we reviewed that final one and then endorsed it. Now the rest of the other things, you know, risk analysis, screening, again we are making progress on a number of things.

Some of them are pretty close to coming to a closure and some of the things are proceeding. So as you will see there are a number of elements which are also discussed in this ISG.

MEMBER CORRADINI: So can I ask a question?

MR. CHOKSHI: Yes.

MEMBER CORRADINI: So this is Mike Corradini. The first thing, the reference on the use of the updated EPRI attenuation models. And EPRI, has that been reviewed by the NRC or is that still being developed. I guess I didn't understand.

MR. CHOKSHI: No, that one is still being developed.

MEMBER CORRADINI: Because it was my understanding there's still some inconsistencies or things that need to be looked at there.

MR. CHOKSHI: Yes, here is how whole thing is working, okay. The hazard one, I mean, is that in fact the industry is meeting today, in their own meeting, to decide whether they want to proceed with this option based on some preliminary analysis they have done. And what they have indicated to us that based on that they will let us know whether they are going to proceed with this option.

In order for them to use this in a timely fashion they need to have an analysis approval, in a sense, by February of '13. But the idea is that if this does not look feasible then they will use the current attenuation models.

MEMBER CORRADINI: So maybe this is a step back. And again I'm not as, John and Dennis are much more in tune to all of this, but if I could take one step back. The source model for all of this is the new USGS for Central and Eastern?

MR. CHOKSHI: Yes.

MS. KAMMERER: It's not USGS, it's NRC, DOE and EPRI.

MEMBER CORRADINI: Okay. But isn't the basis of that the USGS?

MS. KAMMERER: No, no. It was a brand new, they participated as consultants to us, but it was not based on the USGS. It was a brand new, starting from scratch, shock level 3 study.

MEMBER CORRADINI: All right, so I apologize, I didn't realize that. I thought it was directly linked to the USGS.

MS. KAMMERER: No, although they're going to incorporate a lot of the elements.

MEMBER CORRADINI: Okay. And so that's

the source that's going into that, that's the basis?

MS. KAMMERER: Correct. Well that's, yes, that's the source model. Then this is talking about the attenuation. And so what this is is a Level 2 Shock Level 2 update to the previous model to address some enhancements that may be needed. And then it will still be replaced by the ongoing NGA East Shock Level 3 Project which is also starting from scratch. Which is a much larger more comprehensive study.

MR. CHOKSHI: And which will come later, right?

MS. KAMMERER: And which will come later, right.

CHAIRMAN SCHULTZ: What is later, roughly?

MR. CHOKSHI: 2014/'15.

CHAIRMAN SCHULTZ: 2014, okay, thank you.

MR. CHOKSHI: So I mean I wouldn't be surprised if it even goes further out.

MEMBER CORRADINI: So the question, it's a little bit off topic, but I guess I want a link to. So as you corrected me that this is really a combination of NRC, DOE and EPRI, which has USGS as part of it. So is the results of the source model that was done here different in the sense of larger magnitude sources than what other civilian

infrastructures are going to have to deal with? I'm lost somewhere.

MS. KAMMERER: So you look at the magnitude distribution relationship, so the probability of different magnitudes. So we're not designing to a magnitude, we design to a ground motion. So really the magnitudes are tied to the likelihood of their occurrence over any particular time.

Civilian infrastructure, for example the USGS National Hazard maps, which we use a lot of the elements, are based on a either 500 year or 2,500 year ground motion. So the ground motions will be smaller because they're looking at more likely events.

MEMBER CORRADINI: Okay. So can I just say it back to you so I get it right?

MS. KAMMERER: Yes.

MEMBER CORRADINI: So you're looking at longer return periods, therefore, you're going to come up with more severe sources than the rest of the civilian infrastructure in the vicinity of the plant?

MS. KAMMERER: Right, more severe ground motions. The sources are the same. They just were looking at the rarer event from the sources. So the ground motions will be higher.

MEMBER CORRADINI: I'm sorry. Sources meaning the locations might be the same but because we're looking at a longer return period --

MS. KAMMERER: Right, bigger earthquakes.

MEMBER CORRADINI: -- you're going to see potentially higher magnitudes or different spectrum or some combination?

MS. KAMMERER: Yes.

MR. CHOKSHI: Exactly.

MEMBER CORRADINI: Okay. So the reason I'm asking the question like this is, that would mean if Plant X, which is in the Region A, is going to have to deal with this sort of ground motion that means the surrounding area is going to get devastated at the same level. So I'm kind of jumping from the source all the way to the end.

Is the anticipation is the plant has to handle this all by itself? This plant is going to have this handle this all by itself or it's going to have to look into Region A for some resources for the safety of Plant X. Because if the extreme and the source is that large there may not be much left in Region A.

MR. CHOKSHI: I think the question you're asking is about EP, Emergency Planning. And I think

how the seismic is considered, I don't think I can give you very comprehensive answer. But --

MEMBER CORRADINI: Well you don't have to give a comprehensive answer. I guess I'm looking for some set of consistency so that the source the plant has to deal with, if it really is going to think about it from the standpoint of really having to really deal with it, then does it mean that the region itself is devastated to the point there's no point of getting extra help from the region. Or they're having to deal with it all isolated by themselves. That's kind of where I'm getting --

MR. CHOKSHI: That's a good question. But if you look at the Fukushima recommendations, we're talking about 2.1 basically. But if you look at the full spectrum of recommendations, that addresses, I think, your question. There's a 9.3 and some of the EP and then FLEX equipment. What do you do considering the conditions, you know, the hazard related conditions not only at the site but outside of the site. How do you bring in the equipment.

So the whole Fukushima thing to me addresses parts of your question.

MEMBER RAY: Mike, this is Harold. I think this word you use, consistency, we need to talk

about it separately. What we're trying to do is withstand a very remote event.

MR. CHOKSHI: Right, I understand that, Harold. And I know I'm a bit off topic, I just wanted to be sure that I understood the sequencing. But I appreciate the clarification. I'll be quiet.

MEMBER STETKAR: Annie, something, it's been awhile since I've looked at the USGS 2008 Hazard Maps and I want to make sure I understand something you said. USGS actually projects their hazards out to something on the order of 10-7 frequency. If you look at their Hazard --

MS. KAMMERER: They don't, we have. We have.

MEMBER STETKAR: No, I'm sorry, if you look at the USGS Hazard maps they actually have peak ground accelerations at things on the order of about 10^{-6} to 10^{-7} per year, out to about 2G.

MS. KAMMERER: The USGS doesn't produce those. Now they have an algorithm that will pull information out of their model but the model was never intended for that purpose.

MEMBER STETKAR: The Hazard maps that I have a very large file for, indexed by latitude and longitude, with many data points typically have, I've

forgotten how many data points they have at each coordinate, they tend to I think it's 11 or something like that, they run out to about 2G peak ground acceleration. And the frequencies are on the order of 10^{-6} to 10^{-7} per year.

MS. KAMMERER: Okay, so one of his questions was --

MEMBER STETKAR: Published by USGS.

MS. KAMMERER: Okay so there's two different things. Well it is but it's not intended for that purpose. The purpose of the National Hazard maps is to support the building codes.

MEMBER STETKAR: I understand that. But if they're publishing those hazards out to that level and using a model then how they extrapolate is part of their business, how you extrapolate is part of your business. I think you were mischaracterizing what's available from USGS.

MS. KAMMERER: Well I think the USGS would be the first one to tell you you shouldn't be using them to that extrapolation.

MEMBER STETKAR: I've talked to the USGS and indeed they say there's very high uncertainties out at the low frequencies and that they do not explicitly quantify uncertainty. They do not disown

those numbers, they just say there's high uncertainties associated with them.

MS. KAMMERER: Well they don't disown them, they wouldn't be using them for a nuclear plant. And, in fact, that's why they supported us in updating their model specifically for our purposes when we were doing GI-190. So I mean I think the update of their model for those long return periods was in coordination with us.

And so we've actually, we needed them and so we did some development. Now let me just clarify though, in response to his question, because he was asking about the civilian infrastructure and that is on the building code, which is that two-thirds of the 2,500-year ground motion.

MEMBER STETKAR: That's right, that's certainly more where they're oriented.

MS. KAMMERER: Right, so that's really where they're targeting.

MEMBER STETKAR: That's true.

MS. KAMMERER: You know, the shock process requires that you bring in all scientifically viable alternate hypothesis. The way that the USGS approaches it, because they're having to produce maps, so they're having to get value for a massive number of

data points, whereas we have 63 sites. And so they haven't needed, before, computational efficiency in the way that they run their model. So they really try and pick their best estimate versus the whole suite of approaches.

The USGS approach certainty is one of the parts of the logic tree of the new model. And we worked together to really update the earthquake database.

MR. CHOKSHI: I think there are two important elements get sometimes lost in this conversation. The one is that we require each plant to do a very detailed investigation of a number of things. So EPRI expect them each, there is need to update the sources at the time that they are doing investigation.

Second thing is the local site response. The parameters used, it's a lot more complex. There are detailed descriptions of the ground motion and stuff and the back-end of the analysis of local site response was a lot of attention being paid into that site. So it's used those things that are differences.

So as you see there are elements here, the point I want to make here that a number of these elements also apply when you think about analysis and

I'll bring that to Dan, the practical elements which are applicable.

So as Annie was mentioning, this is evolving work. For example, here is the -- I picked the position 2, because it's a closed position. But this is how it started out, the use of existing information. And then so they investigate the issue about how do we go about using the site information to do the local site response analysis. And how do we do the site response.

So it is outline its position then justification and also define what they will do to justification a basis for their position. And so very early in the process that defined the study we had a dialogue, where everybody said yes, we are on the right or we think there is some fundamental issue here. Do we agree with the studies you are doing. Do we want you to include some different to modify. And we had a dialogue of that nature.

And on this one, this particular issue is closed and in the latest one now it's pulling the report from, but then this is describing the studies that were done to support that. So we listed the forces, that's how each of these issues are working.

And so I'd like to give you sort of, when

we talk about ISG, SPID and why we're incorporating some of them at this time, though it's in draft form, is so the people can understand what the position is. It will evolve but it will give you a very good indication of what it's going to look like.

So that's what the SPID is about. So I'm going to walk through some of the key positions. And I started with one of the first basic parameter you need, review level earthquake.

For this application, and that's one of the reasons why this is limited to this application, because I'm not sure that the review level, you may want to use a different review level for a different application so that's one thing. This is not a DRLE, it does not answer question forever.

So the RLE: to use this we have defined in 50.54 is the envelope of the SSE and the ground motion response spectra. We want to make sure that you capture at least HCLPF, if it's above that, it gives us certain information. If it's below, it gives us certain information. So I think idea is to, you want to at least see if the margin is up to here.

So that's the review level. The initiating events, I think this is very similar to what was basically, this is the one that I think Bob

may want to elaborate. If you read 4334 you will not, to me it will not clearly come to the conclusions, it's only asking for transient LOCAs. But if you look at the application and other things, it's mostly transient and small LOCAs and some medium LOCAs particularly for BWRs.

DR. BUDNITZ: Well, the best thing to say is that the original NRC -- this is Bob Budnitz. The original NRC-SMA method only stopped analysis with early injection, that was back in 1985. And that's what supports this before and guidance in 5076 for BWRs that Paul Amigo wrote.

But we're extending this all the way out. We're interested in the full response including NERF. Full response means switch over to -- BWR switch over to suppression-cooled cooling. All the systems and so on that go along with that. So all the systems that cope with the other things anyway.

MR. CHOKSHI: And so I think the --

MEMBER STETKAR: Nilesh and Bob, either one of you. In the ISG it says kind of well, look at transients and small LOCAs and oh, look at transients that look at relief valves. Why are we taking pot shots at this thing? Why don't we experience from risk assessments?

DR. BUDNITZ: That comes from it.

MEMBER STETKAR: That's one thing to look at. For example, why do we know that unrecoverable loss of offsite power is something that we ought to assume with this?

DR. BUDNITZ: Oh, that's from experience with earthquakes not related to nuclear power plants, just earthquakes that damage the grid.

MEMBER STETKAR: Let's look at the earthquake that hit Japan. And indeed Fukushima lost all offsite power. The other nearby site almost lost all offsite power but they didn't lose all offsite power, they still had some offsite power. Now, if I try to think in risk assessment space and I try to think about reactor coolant pump seal LOCAs, which tend to be important for some PWRs, and I try to think about new PWRs with new seals.

Or old PWRs who have replaced their seals who claim that as long as the pump is stationary they don't get any seal LOCA, then indeed unrecoverable loss of offsite power is optimistic for those plants. So how do we know that unrecoverable loss of offsite power is universally conservative? How do we know that?

DR. BUDNITZ: Say it again, how do we know

that it's --

MEMBER STETKAR: How do we know --

DR. BUDNITZ: Conservative meaning the plant would be better off if it lost it than if it kept it?

MEMBER STETKAR: Yes. Reactor coolant, if you think of risk space, reactor coolant pump seal LOCAs tend to be very important types of scenarios. For pressurized water reactors, at certain plants. New plants, and some old plants that have updated their reactor coolant pump seals, claim that as long as the pump is stationary, i.e., not rotating, they will get minuscule leakage from their seals even if they've lost all cooling.

If my plant happens to be one of those plants and I assume, according to the guidance, that I have loss of offsite power I don't get any seal LOCA, if power is still available and my pump is still running I might have a seal LOCA if I lose those cooling systems. So therefore, please explain to me why loss of offsite power is universally conservative for every single plant.

DR. BUDNITZ: Well you would have to assume, I mean, let's just back up. Let's suppose that the power was there. Do they have procedures to

--

MEMBER STETKAR: I'm not doing a PRA, Bob. I'm questioning your universal assumption that this is conservative. If you want to do a PRA let's do a PRA where I account for the procedures and I account for the timing and I account for the human performance and I account for the seismic failures of all the other systems that effect cooling. I'm only challenging this universally presumed conservative assumption.

DR. BUDNITZ: I understand that.

MR. CHOKSHI: But, Bob --

DR. BUDNITZ: No, let me say, at such a plant if the offsite power was there, do they have procedures to cut those pumps? I don't think so. Hence, they can't take credit for that. Right? I don't know a plant like the one you know, that you've mentioned, I know two or three like that. But I don't think they have procedures to say to the operator, you know, because of seal LOCA you should kill those pumps.

MEMBER STETKAR: No, they don't. That's my whole point.

MEMBER BLEY: This is getting a little confused, I don't think you need to pursue it. But in fact they do, if you loose cooling the procedure is

cut the pumps.

MEMBER STETKAR: If you loose coolant.

MEMBER BLEY: But John's just making the point that the assumption that that's conservative might not always be true. Especially when --

MR. CHOKSHI: But genesis, I remember, and Bob can correct me, but the idea was with two things. One starts with the transients, they've lost the offsite. And the second one starts with the condition small LOCA.

MEMBER STETKAR: But both with no power.

MR. CHOKSHI: Without power. And the small LOCA the assumption was not, the reason was you can walk down the many parts of the plants but you cannot walk down a lot of small tubings and things. And so that under seismic there was no business not to assume small LOCA without pinpointing to that particular source of small LOCA. So that was the idea that then so that you would construct the tree, how you're going to respond to that small LOCA situation.

And that was the whole idea was simplifying that for the trees are simple in the margin methods. Because you're starting with that, and I think Bob and Ravi that 4434 specifically talks about that, that why we need to retain, how we came

about with small LOCA, it was because the inability to say, I can walk down the plant, do the calculations and rule it out.

DR. BUDNITZ: Yes. By the way, going back to John's comment. If you don't mind my saying, going back to that. If somebody wants to try to take credit for that they had better do a site PRA, okay. In other words the SMA is not going to be universally conservative in that regard, I agree.

MS. KAMMERER: Can I make one comment, just as not somebody who is an SMA or a PRA expert by any means but someone who has done a lot of post-earthquake reconnaissance. Is the idea, whether or not it's conservative, the reality in the vast majority of earthquakes you do lose offsite power. You do lose power, I think you can't necessarily look at a Japanese grid in its robustness and compare it to the U.S. Because if it goes for more than a second or two, like then it's extremely common.

So for me it's just more realistic. I would question whether or not someone had that because that's just typically what happens.

MEMBER STETKAR: It depends on the site, it depends on a lot of things. The only point I was raising here is that the experience of people who have

limited experience, you know, looking at PRAs and looking at different sites, may not be most appropriate for every single site in the country.

For example, even in design-basis accident analysis, Chapter 15 analyses these days, we ask people to look at loss of offsite power and we look at non-loss of offsite power and say take the more conservative of those two for your design basis accident analysis. In some cases loss of offsite power indeed is more conservative. In some cases they find that the non-loss of offsite power is more conservative so that --

MR. CHOKSHI: Yes, I think like 1150 that's how sort of we developed the hierarchy that assume transients with power, transient with loss of power.

MEMBER STETKAR: Yes, that's right.

MR. CHOKSHI: I think here, to me, I think that was that started with a margin question, this whole approach. An idea was that am I capturing all the components and then the system structures if I use this, you know, it's not necessarily based in optimal use of the, you know, but to me that was driving the assumption, some of these assumptions.

MEMBER STETKAR: And with a presumed small

LOCA you might be. You might be.

MR. CHOKSHI: Yes. Because one of the things, as Bob was mentioning, that we looked at, compared after Hatch, EPRI, SSELs and NRC through your system approach, it looks pretty similar. In fact, with the NRC approach you could bring in some of the other options which are hard to bring in in the EPRI options.

So that was one of the check. And I that by recapturing all the elements we know which control the sort of seismic risk. And a part was by this simplification you will be able to capture most of those components. Which you might want to look at from the capacity point of. So that was the thought.

But I think you are right, because I often wondered about that question about seal myself, because the seals, you know, the old PWRs was that one of the sequence once you got a loss of component cooling or something and you loose the seal. So late failure of containment. I'm not sure it's worried anymore with the new seals or have anybody looked at it.

MS. KAMMERER: So is there something that we can do before the guidance?

MEMBER STETKAR: Well, I'm not going to

presume. I think it's something you ought to think about.

DR. BUDNITZ: John, it's not a small point.

MEMBER STETKAR: Oh I know.

DR. BUDNITZ: In fact, for anything like this, if a plant wants to take credit for something like this they can take exception. Okay?

MEMBER STETKAR: Well that would be good if the ISG kind of reminds them that something in there might be optimistic.

DR. BUDNITZ: That's a good point.

MS. KAMMERER: Yes.

MR. CHOKSHI: And this is one of the things why, you know, some of the time we need to revisit some of these questions.

DR. BUDNITZ: By the way, this Bob Budnitz, I've got to tell you something and I hope this goes down as best it can. I chaired the panel that invented SMA for a different purpose in 1985. It was for Eastern seismicity. Now if I had my druthers, the number of plants that will use SMA response time would be zero. I think it's crazy, right?

I just thought I'd say that. Any plant wouldn't do a seismic PRA. On the other hand I'm not

the plants and I'm not the staff. That's just speaking per se.

MR. CHOKSHI: The rest of the stuff I think Bob already covered when he was talking about extending mission time and --

MEMBER STETKAR: Well, a couple of questions I had on the mission time, Nilesh, and this is only to help me. It was kind of mission time and what is stable shutdown. If I read the ISG in one place I'm kind of led to believe that you need to go to cold shutdown, and it's in Section 4.2.1 that I found those words. It's clear you want to extend it out into recirculation, which I think is eminently reasonable.

But I found the words cold shutdown and that got me a little bit confused about what is stable safe shutdown, whether I can actually terminate the thing at hot shutdown conditions, which I don't know what the answer to that is.

MR. CHOKSHI: All right.

MEMBER STETKAR: And then the second question that I had was where you discuss the 72 hours. The statement, and this is in 4.4.2, says, "for each potential accident sequence, the mission time for the safety systems and functions that the SMA

analysis evaluates should extend to either 72 hour or to the time required to achieve a stable state, whichever is longer."

What do you mean by "achieve a stable state?" For example, if I presume that offsite power is lost and unrecoverable, my emergency onsite power supplies need to run for some period of time. Is that 72 hours, is it 76 hours? Is it 68 hours? Is it forever? Forever is longer than 72 hours. So what do I mean about "achieve stable states?"

For example, if I need a makeup source to replenish a water supply and I need electric power for my makeup source and I've got enough in my tank for 76 hours, does that mean my diesels have to run for 76 hours? Or I've got a week's worth of water, does that mean they have to run for a week?

Because, the reason I raise this is, if you're going to use some sort of numerical importance measures to start screening the results from these scenarios, if I start running diesel generators for things like four, five, six, eight, ten days, you may get a very different skewed impression of what the important contributors are compared to a different mission time, in particular for diesel generators. But for any piece of equipment that has to run for a

long period of time. Could be turbine driven pumps for example is another attended piece of equipment that has a fairly high running failure rate.

So I think, I don't know, has the industry kind of questioned you about what that means? The whichever is longer is what's bothering me.

MR. CHOKSHI: Yes, I say it's a good idea.

DR. BUDNITZ: Let me try, this is Bob Budnitz again. The reason for the extra words are that stopping at 72 hours didn't make sense as an arbitrary thing. That's what the old things said, it said 72 hours, stop. And you know, by the way, when we went to Fukushima they were still on RCIC until almost 72 hours, never minding getting to the, you know, that next phase.

So 72 seemed arbitrary for sure. So the point was that you wanted -- But if you got on to recirculation in 39 hours we still wanted you to run out to 72.

MEMBER STETKAR: That I got. The question is what is a stable shutdown state and how long do you need to --

DR. BUDNITZ: We were going to let analysts tell us in a plant by plant.

MEMBER STETKAR: Okay.

DR. BUDNITZ: There may be a plant that says, gee, we're going to be better staying at hot shutdown for a week. If the analyst says that's better, for a certain reason, okay we can accept that if that's better. Put out a week then other help.

MEMBER STETKAR: That's all right, I raised the cold shutdown because the only place I found it was in that introductory area. And I thought that the intent was to allow people to maintain stable hot shutdown, because that tends to be what people are doing these days is defining what safe shutdown is.

MEMBER BLEY: And I guess some thought on even what that means is important. Does that mean you're living on one diesel generator? Or what does it mean to be stable?

MEMBER STETKAR: Yes.

CHAIRMAN SCHULTZ: That's why they need to provide additional guidance as to what --

MEMBER STETKAR: Achieve and maintain, if it's achieve and maintained how long do I have to maintain that?

DR. BUDNITZ: Okay. So let me just push this one step further. Are you suggesting that in this guidance the NRC provide some specifics about that? Or alternatively, what I think is here now is

that the analyst who's close to the analysis gets to decide and explain it.

MEMBER STETKAR: I think it's important to clarify what you mean by achieve stable shutdown.

DR. BUDNITZ: Helpful.

MEMBER STETKAR: Because getting to something that you say I'm stable here for X number of hours might be someone's interpretation of what that means. Maintaining that condition for X or Y or Z number of hours after that point may be someone else's interpretation of what stable shutdown means.

So you may get, I'm thinking about the responses you'll get to this. You may get a different set of responses from different licensees depending on their own interpretations of what those words mean.

With those responses may come then different lists of relative importance of pieces of equipment. Or different cutsets or scenarios or sequences or whatever you want to call them depending on what assumptions they've made about that timing.

DR. BUDNITZ: That's correct. So I guess we'll take the advice to try to provide more here without being I'd say prescriptive it would be appropriate.

MR. CHOKSHI: Yes, I think, Bob, what I

got from this I think that we need to explain what we mean by this so when the licensee responds, as you said, they can explain but they know what they're explaining.

MEMBER STETKAR: And so you know what they're doing pretty clearly, because if you do have those discrepancies you can at least have the same --

MR. CHOKSHI: I think that's good because I was thinking more in terms of the recirculation phase, more than anything else.

MEMBER STETKAR: Understand, I'm thinking transients with makeup water and things like that.

MR. CHOKSHI: Yes, I was thinking like you know, you would have to go to an alternate source.

CHAIRMAN SCHULTZ: So there's two parts here. One is to ensure that there's a consistent understanding of what is the end state that's expected. And the other is to be very clear that if the process is going to allow the analyst to describe what that is for their particular plant that the level of detail that you would expect in order to review that appropriately over the range of analysts that will come in with different explanations that you set your expectations regarding that explanation.

DR. BUDNITZ: Yes, that's fair. So we're

not going to have an acceptance criterion on the configuration or anything. But an acceptance criterion on the level of detail of the expected documentation of what their decision was?

CHAIRMAN SCHULTZ: That's correct. I would recommend that highly.

MEMBER RAY: Well, let me just add one thing here. I mean as John knows, he used an example that I love to use, it's exactly right. And I don't think this is at all unimportant. There's too much incentive to make other decisions than the ones that you would be making if you had to explain them.

DR. BUDNITZ: Yes, but you see but there's also the plant variability in the following. For some plants they have really high confidence they can get help by the fifth or sixth day. And maybe some other plants say, you know, we've got to stand alone here for ten or 15 days. Remember this is a huge earthquake that damages infrastructure, bridges, hospitals, ambulances, police. And how long they think they can, or need to, stand alone will differ.

CHAIRMAN SCHULTZ: Now you're hearing Mike Corradini's comment that he made earlier.

MEMBER CORRADINI: Thank you very much. That's what I was starting to worry about earlier.

DR. BUDNITZ: But that's the plant specific argument that the analysts can bring in if they have what they know.

MEMBER RAY: Well wait a minute, that's not your comment I don't think, Mike. You were using the word consistency as if the plant would be designed to the same thing as the surrounding region would be.

MEMBER CORRADINI: No, that was part of it, Harold. My comment was, first I wanted to understand the source and the difference in the source used. So that part I was incorrect and that was clarified.

My point is now, I've putting on the plant a higher source and then I have to cope with it. Now if I do that I'm looking for weak links beyond the design-base. Now I'm going to have to ask the plant to decide how they're going to cope with it.

And if they're going to cope with it, and they need outside sources, the outside sources could be affected by the same event. So they have to decide, you know, is it realistic that I'm going to have offsite sourced help.

MEMBER RAY: Okay, that's fine.

MR. CHOKSHI: But I think I just again want to remind that that question of the entity of

recommendation deals with all the different timeframe and outside help and stuff. So this 2.1 activity is strictly looking at the new design-basis and effects and the things we want to do associated with the changing design of the plant.

MEMBER CORRADINI: Okay, but let me just say it once more and then I'm going to stop. What worries me about all these recommendations is they're a little bit here a little bit there. But yet, the worry is I have a seismic event that's beyond the safe shutdown earthquake. I want to understand the weak link so I fix them, or at least identify them and decide how to fix them.

Once fixed if I, god forbid, have anything that's above the safe shutdown earthquake I have to plan for it. And that has to be consistent across the board. It can't just be what's on the plant site, it's got to be how I expect help from the outside and what time I expect the help.

Because if it really is that large of a natural disaster people are scurrying about on a whole other set of issues that have nothing to do with the plant. And so you can't count on outside help necessarily.

MR. CHOKSHI: Yes, and I think like the

4.2 and others address those points. Based on my understanding. That this is, as a part of looking at the total, they are looking those type of things. And under what conditions, and outside help needed and how do you, given the situation, is it able to provide that help.

MEMBER BLEY: I guess this is a point we've talked about in previous letters. I know one has to parse this whole thing apart into pieces to address them. On the other hand, the real world exercises it all at once and somehow after we're all done it has to be reintegrated. We have a lot of things living right now in regulations that are this piece and this piece and they just don't work to well.

MR. CHOKSHI: And one of the things probably is not clear is that we worked with other project things, which are dealing with other things like ISG on the 4.2. We have been talking about what we're doing. So people are aware of that similar type of question. But, yes, it's very hard and then you have to put everything together.

CHAIRMAN SCHULTZ: And here, just to reemphasize, where you're talking mission time as the example. It's not enough to assume that there is going to be a link between Parts A that someone else

is doing and the project is being done here. At least we need to say, at this point one must consider what is happening with regard to the region. And so assure that the analyst is not thinking in a box but is thinking about the entire scenario.

MR. CHOKSHI: Yes. I think that was, we will go and definitely expand on this discussion. All right, I'm going to go to the next slide. And this talks about non-seismic failures, human actions.

And I think in the past, SMA, particularly in the success path approach there is the general reliability number that you must have your argument or human actions. You need to make sure that they meet certain reliability requirement. But other than that this no longer appears in the analysis.

And I think it's here it's important, particularly you know, switch order phases and things that are the human actions and random failures have shown up in combination with seismic failures so I think in order to get a full picture we need to include them on the explicit limit risk.

Now the screening of SSCs, that's, you know, that is a evolution in some sense. The user screenings table are still being used in both NRC document and EPRI document. But what we learned from

IPEEE that if you, you know, if you can come up with many situations where either you are not able to make a statement about the plant HCLPF capacity because your reading level is so low, and you are screening out component, because the component capacity are higher. Or that thing you assumed is very high capacity is showing up as a dominant contributor.

So that's sort of a anomalous result. And so that has, there's been a lot of discussion about what kind of guidance we can give. Reserving the separate screening, but we know there are inherently strong components, we want to maintain that. But we also want to get it right inside. And I'll discuss that in a lot more detail.

This has a direct connection to the scope of work you have to do. How many components you have to do specific calculations versus you can rely on some generic characterization. So that has been a lot of discussion.

I think, what we've got coming out, I think it seems to me that first a much more reasonable position than has been experienced in the past. So I'll talk more about that more, later.

Plant walkdown. I think EPRI is probably one of the best piece of guidance in terms of how to

conduct walkdown and how to record in the EPRI document. So I think that's what we are referring to that. And that's what we also did at IPEEE, that anybody using any method, PRA, safe shutdown or the NRC, all plant work done all that comply with the EPRI guidelines.

MEMBER STETKAR: By the way, Derek, can we get a copy of these? This is not one of the EPRI reports that I could find publicly available. I couldn't find it anywhere in ADAMS either.

MS. KAMMERER: It is publicly available, I'm positive.

MEMBER STETKAR: It is?

MS. KAMMERER: Yes, on the EPRI site, but we can get you a hard copy.

MEMBER STETKAR: An electronic copy.

MS. KAMMERER: Oh, yes. That's what I mean. A digital file. It seems like I have it with me.

MEMBER STETKAR: Okay, thanks.

MR. CHOKSHI: So the plant walkdown I think is straightforward and I don't think there is anybody, everybody expects to do according to the EPRI.

The responses, now a lot of things, a

couple of long, in how to generate structural responses. Do you have to use new models, do you have to use existing models. How do I scale my, you know, that. All of those things are kept sort of in responses.

And again I'm going to discuss that in more detail. This is the element which cuts across both PRA and SMA. How do I decide when I use my existing models, when I can scale, you know, and what conditions I cannot.

And we talk about seismic margins, how to compute the HCLPF, and I think we had a discussion about CDFM and generator also. I think, I'm going to go back and sort of revisit that to make sure that the caution, and you will see that there is a caution that they expressed in that. But I look at that our process will capture that provisional conservatism.

MEMBER SHACK: Just coming back to this for a second. When you picked your review level earthquake, I mean that's probably as low as you could pick your review level earthquake. I mean it's really going to be, the nominal design-basis. And so you're not getting any picture of margin.

MR. CHOKSHI: The reason I think we picked that, you know, if you look at the new GMRS is about

roughly 10^{-4}, it's between 10^{-4} and 10^{-5}. And if you got an HCLPF at that level, at about 0.1 percent probability of failure on the composite, so 95 percent confidence, you have a pretty good chance that the core damage is 10^{-5} or below.

MEMBER SHACK: Okay, you're looking at HCLPF level.

MR. CHOKSHI: So that was sort of the idea. I want to make sure that the HCLPF is, and that's why when I come to screening, you will see that. It will be nice to know what that value is. Rather than simply saying I'm higher than the, you know, in some cases it may happen. But the thought is if you want to capture, so when it comes to the screening we are trying to do that. We don't want to screen people at that level.

MS. KAMMERER: And he'll show you some details in a minute.

MR. CHOKSHI: So on the whole issue of high frequency component has been around for a long time. I think the 1407, we dealt with what we called bad actor relays were knew based on some of the test programs, the relays which had the problems. And that was basically they were replaced.

I think at this time, I think for me, I

think the industry is doing the right approach and we've sort have been encouraging them to do is to undertake a comprehensive test for that.

You know, of the high frequency sensitive components. Basically the things that change of the state type, you know, the contactors and relays. And so I'll describe that in more detail, because I thought this was would an interesting topic for, you know, so they have already initiated the Phase 1 of test program. And again it could be completed in -- Do you have a timeframe complete?

MS. KAMMERER: The first phase will be completed by November and some of the initial lessons learned will be incorporated into the SPID. The second phase, which will be heavily informed by the results of the first one, will be completed next November, so 18 months, basically.

MEMBER STETKAR: You have another slide?

MR. CHOKSHI: Yes, I have a slide on that. I was going to talk in a little bit more detail, because that's, to me, I think personally I'm very pleased with that kind of effort because we have been always talking about some of the ad hoc, and this is a more systematic look at the issue.

Soil failure modes are very applicable,

the guidance is out there. And I think basically what we are saying that, you know, you have to look at for the sites which what they have potential for leak detection and things of that nature. How to come up with a sequencing plan with HCLPF. I think again there's a convolution approach particularly when you have non-seismic and human actions.

And then the use of Min-Max, again Min-Max with justification, because under some situation it could be not necessarily a minimum HCLPF and it could be also very, very extraordinarily conservative. I think Min-Max approach, then people need to think through.

And documentation. They tried to use a lot of the typical things we expect from PRA plus things we need from 50.54(f) letter. So I don't think that's too much different that what you might expect. But my anticipation is that we'll get a comment on that also from the industry, because they might think that we're asking a little bit too much.

Peer review definitely will get a lot of comments. What we are trying to do here is not to impose ASME standard type of thing, because first of all the resources and the timing will not help us. We don't want the review to occur at the late stage where

the things are sort of cast in concrete and the people can't go back and take into account.

This is sort of maybe a bias from my IPEEE experience. Because a lot of the peer review didn't really help the process because they were not dealt with. Here we want them to see that they address them, they're documented and we understand what the peer review process is.

MEMBER STETKAR: I had a couple questions about the peer review, because have you talked to the folks who are doing the NFPA 805 transitions about peer reviews? As I read through the ISG it said you encourage participatory peer reviews, you just mentioned it. You also say that you expect a peer review of the final report, which to me implies some sort of ongoing peer review and then a final determination about how issues that were raised were finally resolved.

MR. CHOKSHI: That's it, exactly.

MEMBER STETKAR: We've already established the fact that there aren't too many people in this world who have the technical capabilities to do these types of peer reviews and many of them are aging and are not all that interested in doing it anymore.

The same problem has been faced by the

NFPA 805 folks. In particular there are many people who have early peer reviews that raised a lot of issues that essentially were raised because they were done prematurely. And not enough time and not enough manpower was available to do another peer review at the end to come to some sort of conclusion about whether the issues were resolved.

In other words, it was a one-stop peer review. A number of issues were raised, the individual licensees developed their responses, but the peer review group never came back and said yes indeed we think this acceptable. Because of timing and personnel. So I'd encourage you to think a bit about this. It sounds good, but if you only have three people in the world that can do these for 60-some odd sites you're in trouble.

MR. CHOKSHI: Yes, and I anticipate that one of the things it says, and I've been thinking about that, you know, we say that at least one offsite. And there are things in that I'm going to get comments back, you know, are they going to be practical or not. And this is useful, because I think we'll talk to NFPA people and --

MEMBER STETKAR: Talk to NFPA because there's a lot of parallelism here in terms of evolving

science and limited number of people with expertise.

MR. CHOKSHI: And what we have here, idea is that really the same thing for the flooding. So I want to be consistent. So I think you're going to like it. And so more peddle to the fire, again, NFPA is a good talk.

MEMBER BLEY: That seemed to cause quite a bit of problems then.

MR. CHOKSHI: And that was probably one of the lesser satisfying part of the IPEEE process, because the idea was to rely on that and it didn't happen that way.

MS. KAMMERER: Can I ask a question? Because I'm not clear on what exactly happened with NFPA 805, was it that the people who were supposed to be coming, they ran out of time? Or the people that who were supposed to be coming back and doing that close out peer review were just too busy with another project?

MEMBER STETKAR: All of the above I think. And talk to the NFPA 805 folks, they have really good stories about problems that, you know, individual licensees scheduled a peer review because they thought that they were going to be further along in the process than they were. But they had the slot for

that limited number of peer reviewers.

The peer reviewers came and in many cases, we heard one example where the peer review team said, there's nothing here for us to review and left. But they already then had slots for their peer reviews because of the schedule. So it's a real --

MR. CHOKSHI: I think Steve has very good experience with this. He probably can give insights.

MEMBER STETKAR: Please state your name.

MR. LAUR: Yes, this is Steve Laur, NRC Staff. I was involved a little bit in the NFPA 805 early on. There was a couple of issues, one is resources. But when a peer review team comes to review a PRA, according with the ASME-ANF standard, the PRA is supposed to be essentially complete.

Now, that was not the case for the NFPA 805 for several reasons and we won't go into those. But what we ended up doing was accepting peer reviews that were done on a modeling progress for a to be built plant as opposed to an as built plant. Or a to be modified plant.

I guess the other thing I heard that is not exactly correct. One thing of the peer review process is that even if it's a complete model, a peer review team comes in and writes a report. They never

come back to validate that the correction of the finding or the facts and observations were performed.

That's left to the licensee and we used to review that as part of the --

MEMBER STETKAR: That's correct, but in this particular ISG the expectation is that there would be another peer review of the final report.

MR. CHOKSHI: Right, that's how it's laid out, yes.

MEMBER STETKAR: Which implies that iteration phase.

MS. KAMMERER: And in fact in the --

MEMBER STETKAR: That is different here.

MS. KAMMERER: Yes. In the documentation section I think there's quite a few where it's specifically called out where they have to document how they close out peer review.

MEMBER STETKAR: That's always the case, though, for any peer review.

MR. CHOKSHI: But I think one of the important points, I think, that in that space on the SPID position, particularly with the industry like on the use of existing structural models, that's an important element of that review by an experienced structural engineer to make sure that models are

existing. So there are some elements where it's specifically integrated into the excerpt positions.

MEMBER STETKAR: That's fine, but it's one of the things I stumbled over though.

MR. CHOKSHI: No this is always a difficult issue.

MEMBER STETKAR: In Section 6 it explicitly says peer review should include review of the final report, which implies that iteration.

MR. CHOKSHI: Yes, and I'm sure that we're going to have both comments on this one internally and externally. And I think we'll coordinate with NFPA.

CHAIRMAN SCHULTZ: Nilesh, before we go forward, we had the general presentation here of the key positions and we've gone into some level of detail and I understand from the slides coming up that we're going to go into more detail. So I would suggest that we have a short break.

MR. CHOKSHI: Yes, this is a good time to do that.

CHAIRMAN SCHULTZ: With an opportunity to reassemble at 10:45.

DR. BUDNITZ: Steve?

CHAIRMAN SCHULTZ: Yes.

DR. BUDNITZ: Can you give a clue as to

when this thing might end? The hour maybe?

CHAIRMAN SCHULTZ: We could figure an hour, it will be before noon. I would expect that it would be an hour past 10:45, or 11:45. Around 11:45 until noon, in that timeframe.

MEMBER BLEY: We're only halfway through the slides.

(Whereupon, the meeting in the above-entitled matter went off the record at 10:27 a.m. and resumed at 10:45 a.m.)

CHAIRMAN SCHULTZ: I'll bring the meeting back into session. And Nilesh, turn the presentation back to you with regard to moving forward with the slides. Thank you.

MR. CHOKSHI: Okay.

CHAIRMAN SCHULTZ: Thank you.

MR. CHOKSHI: So I think we went over most of the key positions you know, and then what I like to do is talk about a couple of things in more detail. So the first issue I'd like to talk about is about the High Frequency Components.

DR. BUDNITZ: And Nilesh, can I say one ten second thing?

MR. CHOKSHI: Sure.

DR. BUDNITZ: I think we can put a clause

in that will recognize the analyst may wish to assume that offsite power wasn't permanently us and then justify why for that particular scenario and so. That's easy to put in.

MEMBER STETKAR: You guys can work on that.

MR. CHOKSHI: Yes, I think Bob, let's discuss that. I think that's you know, yes. But I think you're right, we got the comments, so okay. So I'm going to go, we are back on the record and I'm going to move to the High Frequency Components slide, okay.

MS. KAMMERER: Oh you know, there's something --

MR. CHOKSHI: On no, yes I'm sorry, I'm wrong. We going to, Screening is the first list. So I'm going to start the slide, which has the diagram of the screening of, that is the guidance of that EPRI NP-6041 and other recent reference EPRI is a bit of some guidance. And very specifically we have addressed this issue within this screen and next SPID.

And this was again, this is the concept which applies to the both PRA as well as margin. In looking from the seismic capacity for inter fuel that it could meant at least you know that you have

selected, that's been dividing into three categories.

One, I'll start from the top. One SSCs Inherently Rugged Structure Systems and Components. And for the part of the model analyst you can assume the structures are general considered, has a lot more capacity and normally you do not include them in the model. There are some of the MOE and some other components.

The second category is the High Seismic Capacity where you know partly of the because of the review level you're looking at a fixed leveled earthquake, that compared to that level the certain components and structures system error.

High capacity for one, provided to meet certain conditions. And those are what are outlining the screening tables into the EPRI NP document and matters.

And then how you deal with those you know, basically the principle lesson learned, I think from my belief was that you do not want to lose this, not only from my particular belief. We like to read in those components at least into the accident sequences, so you don't lose them.

But now the questions is, do I need to do specific calculations for them? Because I know high

capacity, but I can assign some components capacity without doing calculations. And so I can reach in the model and then depending on the outcome of the reasons, I may have to go back and look at it, what do I do with components?

The remaining components are, you want to make sure that are in your analysis and you would do a specific evaluation by using either you know, both CDFM matter or separation of variables. But you retain them and do specific calculations.

Now so this is sort of how, looking at this from a seismic capacity point of view.

So now how do you, you know, apply this and what should be the level that should be applied? So the first thing the position, key position is that when high capacity issued to be assigned, capacity equal to the screening level, okay.

Because you ascertain, from that screening level you can do a lot. So that's considered already that your capacities high, but let's keep them on the model. So they'll show up in the cutsets and in other places.

And the screening level now, this is the one which was the problem and it's still involving. The number here are the industries doing analysis to

support some of these numbers.

We have seen partial results and so confirmed that you know, are these the appropriate numbers to use or do we want to define a process were we come up with an appropriate number. But the concept is that it has to be a significant higher then the RLE.

So for this purpose based on the information earlier, when you take two and a half times the RLE, okay.

MEMBER STETKAR: And that's just and arbitrary selection at the moment?

MR. CHOKSHI: It's basically, it's not that arbitrarily but looking at some of the core damage frequency, calibrating to that you know.

MEMBER STETKAR: I understand the rationality between, behind the second bullet there.

MR. CHOKSHI: Right.

MEMBER STETKAR: That essential says, if everything fails I have an HCLPF for $5x10^{-7}/y$

MR. CHOKSHI: Yes.

MEMBER STETKAR: Fine, I can understand that rational. You can argue with what the number ought to be but I understand the rational. I absolutely, I don't understand the background. I

haven't seen any of the discussion, but for the life of me I cant figure out why a HCLPF capacity 2.5 times the RLE has any basis --

MR. CHOKSHI: I think we're just going back to this, because your RLE is 10^{-4} minimum.

MEMBER STETKAR: I understand.

MR. CHOKSHI: Okay? So now if I take a 2.5 and that's not one percent probability of failure, I can do some kind of computations, again, assigning generic beta and stuff, and what that means in terms of core damage. This is very broad, you know, but --

MEMBER STETKAR: God, if you can do that you're really good. I can't.

MR. CHOKSHI: Well, in a sense, if I divide HCLPF capacity by 2.5 and have a fixed beta, how does that affect my, you know, it has to do with the hazard.

CHAIRMAN SCHULTZ: So there is some evidence that would suggest that these are relatively equivalent?

MR. CHOKSHI: I mean you know, that other kind of study has been ongoing, but to me that's what you want to wind up with the safety value here.

CHAIRMAN SCHULTZ: Yes I understand that's what you want, but I'm just wondering what evidence

there is that --

MR. CHOKSHI: Yes, no it's --

MEMBER STETKAR: I would certainly hope they're somehow equivalent.

CHAIRMAN SCHULTZ: Yes.

MR. CHOKSHI: Yes, sure --

MEMBER STETKAR: Otherwise, you know.

MEMBER BLEY: And that's their report that deals with that --

MR. CHOKSHI: They are preparing, yes.

MS. KAMMERER: Preparing.

MR. CHOKSHI: The industry is preparing it, yes.

MS. KAMMERER: At their last public meeting they presented the first phase of research and so we can provide that for you, but it's basically the minutes of the last public meeting and they will be writing it up in, although it's a little bit confusing how it was presented if you do look at this.

MR. CHOKSHI: Yes, if you looking at the slide it won't be --

MS. KAMMERER: It's challenging.

MEMBER STETKAR: Well that's why earlier I think we said that, if this is part of SPID --

MR. CHOKSHI: Yes.

MS. KAMMERER: Yes.

MEMBER STETKAR: -- we'd kind of like to see it for --

MR. CHOKSHI: Yes, and then like --

MEMBER STETKAR: -- get more stable.

MR. CHOKSHI: And as I mentioned this is a critical item you know.

MEMBER STETKAR: Yes.

MR. CHOKSHI: Because this is what effects a whole lot of things.

MEMBER SHACK: I mean, I assume it's the same hand waiving argument that you got to in 1.208, which was your performance base. That's how you came up with the 10^{-4} is acceptable because when you sort of did the back calculation you came up with the --

MR. CHOKSHI: Yes, well I think that's a good --

MEMBER STETKAR: Well but I mean this is a little bit different, this is screening.

MR. CHOKSHI: Screening.

MEMBER STETKAR: It says, that if, yes second bullet --

MEMBER SHACK: It think he does the same sort of calculation --

MEMBER STETKAR: But the second bullet

says, using a mean point estimate. That says that, I take it HCLPF, I derive a mean, I run it through and analysis and I get to a frequency of failure of $5x10^{-7}$. If everything fails, that's a large early release frequency, so I can sort of understand how that is done.

I don't understand how that, without knowing the hazard curves and without knowing what assumptions you've made about betas and things like that, I don't know how the 2.5 times the review level earthquake relates to that same sort of thinking. That's what I was sort of challenging.

MS. KAMMERER: But one other thing that sort of --

MEMBER STETKAR: I think that's a little different then 1208.

MS. KAMMERER: -- helped me to understand it to is remember this is just for, this is for the first pass of the screening of the model. They still have to go back and do the check to look and see, did any of the components that were screened show up as were significant, in which case they have to go back and they have to redo the actual capacity.

So they can, regardless of what we put there they can follow the guidance or not, using a

different criteria. Industry is looking at between two and three those are very high, but they have to still go back and do those checks.

MR. CHOKSHI: Well, one thing may not be clear from this, I realize that. The second phase applies to the component probability of failure. So to me we can evaluate the second part first. I can come out with what I need to be on the first bullet.

So I can start correlating. I think the question you were asking.

MEMBER STETKAR: Yes but if you do the second part first why would you need to?

MR. CHOKSHI: From the study point of view. Because you know, we have a hazard corroborative of the site because coming out from 2.1. I sort of back calculate, again I pre-assume some genetic beta and what the emission capacities. And then I will see where I am. So I think that stack has not been done to demonstrate that it's not equivalent.

MEMBER STETKAR: Then I guess I'm not as far along as you are. The second bullet suffers from that thing we talked about earlier. You want a screen to be, to come circuit. You don't want to miss anything when you do the screen. And the beta that you pick to come up with mean point estimate with

HCLPF anchored curve really ought to be a pretty low one.

MR. CHOKSHI: Yes it is. And the industry study is looking at that also.

MEMBER STETKAR: I assume they are ready a basis document with it or something?

MR. CHOKSHI: Yes, exactly, right. I think that you're correct but we haven't reached that point. But I think the source for in order to at least have something for people can react to 2.5.

MS. KAMMERER: I want to ask this.

CHAIRMAN SCHULTZ: For the folks that are on the bridge line, can you make sure your phones are on mute. We can hear papers rattling in the background. Thank you.

MR. CHOKSHI: I think Annie just pointed out that also you wanted to keep the screening level high. So 2.5 times, for application you need to actually come up with a non level. And keep it high that all the caveats are addressed and also that your not using or listing out some important things.

And so then I think the total relating first of all to anything we're talking about is that in the end, again we want to make sure that we all depart from the check. Everything else in the plan

when we start the analysis your perception of what is required to get any conclusions and what was high seismic capacity. So the question about it, then you need to go back and look at it.

MEMBER ARMIJO: A quick question. The screening level of 2.5 or $5x10^{-7}$ year do these have a history or are they traditional. What's the basis for those?

MR. CHOKSHI: The history, people have always recognized that the screening level needs to be not necessarily unilaterally. You need to challenge the components. Otherwise you be able to spin out. And that was, I like it quite a bit in that particular application.

So when the ASME and ANS standard, it specifically talks about caution in that select. It does not specify specific levels. This is the first time we are specifying the levels.

MEMBER ARMIJO: So it was just a judgment call on the basis.

MR. CHOKSHI: Yes judgment call and then what the industry has done is get, and then say I have information on this. Now I went back and applied this criteria to this study.

They then take certain components and as

you generate based on my screening level. And that's basically that's starting with the second bullet first.

If I assume seven year probability of failure how much incremental changes in the risk. What insights I am losing and so on. So they're testing those different limits.

MEMBER STETKAR: You just said the industry has taken ATRA meaning all of this stuff generically for every plant in the country is being derived from an evaluation of one plant.

MR. CHOKSHI: We could look at more but so far what we've --

MEMBER STETKAR: Could, but have they?

MR. CHOKSHI: No their plan is to look at more. But so far this is all work in progress. What we are assuming is from one study. We are going to do a number of things. They are going to look at a number of different hazard. They are also going to look at different criteria and they're going to look at some more fragilities.

MS. KAMMERER: That's right.

MEMBER STETKAR: Are they doing all that by the November?

MS. KAMMERER: Yes they are.

MR. CHOKSHI: Oh yes. In order to them I would say within the next month.

MS. KAMMERER: Yes they're supposed to have the rest of, the remainder. I'm sure they are putting out results tomorrow. And they have to have it all written out within a couple of months.

MEMBER STETKAR: Okay.

MS. KAMMERER: So they've already done the looking through, they've already gone through the different frequencies of failures. They've already done some of the work on the input motions.

MR. CHOKSHI: Still there's a lot.

MS. KAMMERER: A lot to do.

MR. CHOKSHI: A lot to do and then systematically sit down and analyze the data. But to me I think this a, I essentially like the having the industry initiative on this. Because this is a big gap like high frequency. And I think we are all first time ordering.

I can see this now, Bill, going back to your question about some parts of this application and we come up with ISG. And then go forward in some other, and come out with a much better equation on this that should be captured in the standard. So both sides, you know.

We look now at structural. This is another big issue. I've got this going, and we've talked about all of the expertise and Bob and Armijo are on the response line.

DR. BUDNITZ: I'm here.

MR. CHOKSHI: So okay. One of the big question if you listen to the PRA and it has stamps from the changing nature of ground motion. As we know, I think if we look at the original earlier PRAs were based on a spectra shape based on a Reg Guide 160, primarily Western type of ground motions.

As we learn more about the Eastern, the spectra look differently. And the screening was very attractive in the past because of all the design spectra and the spectra shape we used in the PRA were comparable. You could use the results of existing analysis to scale to increasing levels.

The second thing is that structural modeling and things you have also. In the past, in many of the IPEEE analysis, people have relied on the design models.

Although at some point they did additional models but we have used one we call a lumped mass model. From my perspective that lumped mass model and type of things we are trying to do for the PRA

standard, none of that is adequate but it requires careful talk and what you are doing is adequate for the purpose.

And how do you account for changes in the spectra shift. When do you decide I want to do a new model. Or my model is adequate for the purposes of what I'm doing here in this analysis. So industry has given a number of ideas for better positions. We have had quite a bit of internal discussions and supplemented that position. And what you see in the ISG again this is ongoing but reflection of that process.

And industry is doing another study, two studies. One study is related to the effect of spectra issue. And that's to me probably the biggest issue that could alter your insights from earlier results. You know, if your responses are shifting that's typical like most of the structures are listed in 10 hertz. And the earlier design spectra, the new spectra are a much higher.

So now what you are estimating capacity of the structure in the rule. It's different now, you probably will estimate high capacity. So on the high frequency component you do the risk. So at some point in time your reasons will no longer become valued or

applicable.

So I won't read all of these but the next this is trying to address that issue. And this is only a part of the position. There are three elements.

MS. KAMMERER: Actually they are all on the slide. Let me go ahead and, it you don't mind, just go ahead and summarize.

So industry came in with three positions with the hope that to the extent possible the existing models could be used. Obviously some of them have more complexity than others.

So we generally agreed that for the purposes of the 5054F letter a lot of the existing models could be used but not all of them. And so they had three positions.

The first one, what is the criteria that says when a model is sufficiently accurate and complex or not. The second thing is when can in structure response spectra be scaled. And that is what speaks to what Nilesh was just talking about.

And the third thing is, when can the existing models, or the original definition of rock was 3,500 feet per second. Now we consider that a soft rock and you would normally do a SSI analysis

now.

But they wanted to go ahead because many of the models have been developed that way with fixed base could they still do it.

And so on the first topic we have now worked with them to develop a list of criteria, I believe it's the writing in Appendix A.

More specifically the elements that they have to look at to see whether or not --

MEMBER STETKAR: Is this applicable both to the SMA and the PRA.

MS. KAMMERER: Yes it is.

MR. CHOKSHI: Actually the origin of this issue in context with SPID.

MS. KAMMERER: That's probably where we can expect to see more of those. So that's in Appendix A. And they provided some, we supplemented it.

One of the things that's clear that in all three of these elements however they get to those ultimate in-structure response factor it has to peer reviewed. It needs to be assessed through an experienced structural engineer.

So that's consistent through and we expect in the documentation for them to then provide all of

the information for the justification at that time.

So on those three particular issues the in-structure response spectra is a little more challenging speaking to some of the issues that Nilesh raised.

But those three structural elements are tied together and they are all covered in the SPID. So why the first point says either go to the standard or use the criteria that's laid out in the SPID.

MR. CHOKSHI: And I think as I pointed out earlier that is unknown. Because these are critical decisions. And you don't want to be at the end of the analyses if you question these.

There is just no time to go back and that's why we, specifically on this one if someone looks at it independently and comes to the same conclusion I think it's safe.

MS. KAMMERER: One other thing I should mention is there was as Nilesh mentioned now we have a lot more understanding of the high frequency content.

A big difference between this and the new reactors is how the high frequency content is being developed. Because as was mentioned, there's that testing program to look at the high frequency

response. And so those two portions of the review are handled separately.

So these models are not going to capture accurately that high frequency response. We know that and so that's why we're addressing it in a different way. So I just wanted to make that clear.

MR. CHOKSHI: I think a little bit I have more. But here I think the initial discussion on the, particularly on the scaling. And I just said, the only mention of that particular one being the shape of the previous input response factor and the shape of the new shift to any structural frequencies used in response and things which would alter the -- basically, the response of the event.

And I think we talked about a lot of these so I'm not going to talk about them more. It is the high frequency. And I think as Annie told you a good segue that you're looking at high frequency issue differently.

Because remember that even for the blinds which we are going to screen out these known hazard beyond 10 hertz. And saying if you exceed the new hazard beyond 10 hertz the thing you'd have to do is to address the high frequency issues. But we don't have a good estimate. That is throughout that high

frequency issue is being dealt with by the space program.

MEMBER BLEY: Is anything sensitive to high frequencies other than contact chatter and electrical equipment?

MR. CHOKSHI: What we are looking at, I can tell you some of the catagories you are looking at. One is electro-mechanical relays, control. Sub-control switches. Process switches and sensors.

MEMBER BLEY: That's circuit breakers, it's still the contact.

MR. CHOKSHI: Yes correct, contact. Electro-mechanical contacts, auxiliary contacts, transfer switches. And in a limited sense, solid state but very limited, you know. It's sort of lumping.

MEMBER BLEY: Those are, the natural frequencies on those as I recall, range like from 20 to 25 hertz, something like that, right?

MR. CHOKSHI: Yes. And then let me talk a little bit about this program, okay? And I think that this program is in two phases. The phase one is to sort of iron out the details of this program.

And before they start on an actual program they're going to, and this is already work underway.

We had two meetings on this issue. They have given a plan, we give comments back.

Particularly we give them comments back on the list of components they are testing and then their latest they are addressing why they are not including some of their components.

MEMBER BLEY: SQURTS did some testing years ago. Are these things they didn't test, or better tests than they've done before?

MR. CHOKSHI: High frequency.

MEMBER BLEY: They didn't do the high frequency?

MR. CHOKSHI: Because at the time they were done, we really didn't know that much about high frequency. So if you go back to Lawrence Livermore test, Brookhaven test and SQURTS test, they do not answer the question of high frequency.

MEMBER BLEY: So more than 10 hertz.

MR. CHOKSHI: We know that typically if you look at Reg Guide spectra there some amplification of the 33 hertz but you start dropping fast.

MS. KAMMERER: In that report EPRI-1015109 which was published in October 2007 as a response to some of what happened about that time. It has a discussion in details the list of equipment narrows it

down to about ten classes.

So this is the sets of classes of equipment that the program is focused around. It's discussed in there so the initial phase which has now been, as you heard, just last week they gave us the final test program for Phase 1.

That covers the range of those and we're also looking, they're also looking at a range of loading levels. So times three, I can't remember, pulse of a random. Things like that which will help to inform it.

Also that information, any lessons learned will make their way into this bid. But it's really, it's detailed in there and there's a few other components that we're asking them to justify why they have taken out, not only the program but 109.

So I think we're pretty happy I think with what's been proposed. We participated in the work shop to develop it.

MR. CHOKSHI: Yes, the motion issue, 16 to 64 hertz, to specifically answer that, because that's the frequency range where a lot of issues are.

MEMBER STETKAR: You mentioned a number of electro-mechanical type devises that have contacts that I can look at. You said very quickly a limited

look at, I think you said, digital INC.

And I'll differentiate now between digital INC which generally means software related things and solid state which generally means printed circuit cards stuck in slots on cabinets.

Sometimes micro switches mounted on the circuit boards. Are they looking at solid state type installations? Because and awful lot of plants now have those. Regardless of whether they've gone to software controls.

MR. CHOKSHI: And I think that's what exactly they are looking at, like mounting.

MEMBER STETKAR: Mounting, they are? Okay, good thank you.

MEMBER BROWN: Can I amplify just a smart chip?

MEMBER STETKAR: I wasn't going to ask because I knew you would want to.

MEMBER BROWN: I just wanted to clarify a little bit this solid state. Software based systems also are on printed circuit cards. So it's not printed circuit cards and mounting.

It's the isolation of the circuits and the analog for the solid state world within that circuit card that can create a problem. So I'm just trying to

clarify a little bit so you don't, all printed circuit.

Well they're all printed circuit cards, they all go in slots. Whether they're software based or otherwise. That's the only clarification I wanted to throw in there.

MR. CHOKSHI: I don't know enough to know. I think that's good.

MS. KAMMERER: It seems to me it would be really useful to come back when we have the results of the Phase 1. Because the Phase 1 is like really happening right now. If we have that because then we have a little bit more time to develop this much larger program.

MR. CHOKSHI: Yes, and that's the next slide is talk about electros too.

MEMBER BLEY: Let me ask you a question about how that's going to be implemented. One thing happened back in the '80, was all the people involved in getting this test set up were mechanical and structural engineers and no electrical.

And they were astounded by some of the things they saw. Where if they'd had an electrical engineer they wouldn't have been so astounded.

I wonder if we have some engineers for

electronics equipment involved in these tests to be thinking about things that might not come to mind to the folks that are usually working on this and I hope so.

MR. CHOKSHI: Yes. I think that is a good question. To find people who have that expertise hard, people that think that way.

MEMBER BLEY: Find people who study seismic, who have that experience is hard. But I think if you get people with that experience they could think up the idea of assertion being the problem.

MR. CHOKSHI: I think we could find the coordinate to set up with this electrical group.

MS. KAMMERER: The work shop that occurred was very large. There was about 15 people there, all different groups of people. The testing is being done in facilities that would typically do qualification testing for nuclear equipment. And there was a lot of discussion in different mounting orientations and things like that.

MR. CHOKSHI: But selection of the components I think the industry went through that process. They talked to the systems people and the staff group.

MEMBER BLEY: I thought that was going on way back when some of the other work was done, and like I say there were things done that had to be redone. And great surprises because you didn't have people who understood the whole electrical circuit involved in the setup.

MR. CHOKSHI: That's a good question, I'll raise that again with them and see who is being.

MS. KAMMERER: Yes, I'll ask that.

MEMBER BLEY: Before we go, when you go back to Phase 1 slide. I just want to look at that last bullet. Annie, you indicated that there's a lot that is going on and that last bullet really has three or four different components in it.

So if you could be more clear with respect to the schedule for this, the test program, the feedback, the validation of the plan and the pilot test plan I understood was going to be completed by November this year.

MR. CHOKSHI: Next year.

MS. KAMMERER: No, not the plan but the testing is going to be completed.

MEMBER BLEY: Yes I understand that, so just for the Phase 1 what is going to be accomplished and is being accomplished very rapidly over the next

1 couple of months here?

2 MS. KAMMERER: Okay. So we've already had

3 a work shop, we've developed a Phase 1, we weren't in

4 the meeting at the time.

5 We've got the final write-up to make sure

6 it's consistent with what we all agreed in the work

7 shop last week. And we can provide that and it really

8 spells it out in much greater detail.

9 And so that testing, in order to get into

10 these facilities, of course because the squad people

11 had it after, the testing is going on, it's happening

12 in two different phases, within Phase 1.

13 So there's testing ongoing right now for

14 some of the components. And what they're going to do

15 then is look at the various loading types of loading

16 and to gain some insight.

17 And then the second set of testing on

18 table I think is going to happen, help me out here,

19 you were at the workshop, in about a month.

20 And we'll have an opportunity once this

21 data been developed, we're all going to sit together

22 in a room and look at it and try to make sense of it

23 because it's an enormous amount of data.

24 MEMBER BLEY: About a month?

25 MS. KAMMERER: In about a month. And then

the second program happens and then we get the report on Phase 1 draft and insights that would go into this bid, all that's completed by October in order to get into the SPID.

About that time then and looking at the draft report and everything we learned at that point the broader program will be developed and scope out and that will be October/November and that will be completed over the following year.

CHAIRMAN SCHULTZ: It's in those two phases based upon the discussion we just had about what personnel ought to be involved with evaluating the pilot test and planning the test for next year.

The electronics experts in addition to those that are probably more mechanical in terms of mounting and so forth. That's where you want to be sure, or we all want to be sure that they're engaged and involved.

MS. KAMMERER: And that will be a very large undertaking.

MEMBER STETKAR: The analogy, again, to a lot of the fire testing that was done if you talk to the fire folks, like Henry Salley, for example. The amount of involvement that they needed to have from electrical engineers when they designed their fire

tests, such that they understood what indeed was being tested and they got the right information. It came from the electrical folks, it didn't come from fire fighters.

MR. CHOKSHI: In fact when the least of the equipment, I did, we did involve here, electrical engineers to look at also. And here also the people were looking at the new reactors the people with qualification background.

I think to sort of summarize there are, for me, there are four big elements of this whole process. One is to the selection of right equipment. The second thing make sure that the testing motions you are using is going to answer all the questions, which is not just, that's why they are looking at different things, you know, the sine beta, the sine sweep and the random input. Because in order to answer questions you have to look at all of those carefully.

The thing is you are going to do many tests once you get it because different cities, different models. That's why the pilot test. Make sure that once you start on the production type of testing, you'll be running a lot of, putting many specimen on the one table and stuff, looking at the

different states energized. You want to make sure that everything works before you go into that process.

And the fourth step which is in the Phase 2 is to now how do I result applying the plant evaluation. That one not in November, okay? How I will get this information and if I want to put it in my models, for example I want to characterize something by a fragility, how I am going to do this. What I'm going to deal with in a different context. So that step has to occur after the testing is complete.

So this is being all the issue of high frequency is sort of being dealt separately but I think to me in the right way. So I sort of went over my Phase 2, but in Phase 2 there is this survey to gather information on types of potentially -- make sure that at that point we know all the right expertise. Another challenges is that a lot of this has to come from the existing plants because we don't develop it off site.

So I think that they are doing good job of that from what I hear about their specimens they have collected.

MEMBER STETKAR: Do you see this process jeopardizing the response schedule?

MR. CHOKSHI: No because --

MEMBER STETKAR: There's enough margin?

MR. CHOKSHI: Enough time because they know this is going to be right, yes.

MEMBER STETKAR: Because I heard this stuff tends to take a life of it's own.

MR. CHOKSHI: I think because we talk about two to five years.

MS. KAMMERER: The way that the information is coming in, so the Phase 1 information going into this bid, they are going to put out as much information related to what we need immediately which is screening, things that are related to screening. And approaches and hazard. The longer term program will be providing a lot more of the fragility data.

And that's something that they don't necessarily need within this bid or immediately. They're going to need that once they start to undertake their analyses. So we're really looking at getting the information in three phases.

First anything that is going to be helpful in screening phases and input. The second is guidance on how one would use this information within the high frequency elements. Either for understanding or for inputting the SRAs and PRAs, and then ultimately the

fragility information.

MEMBER STETKAR: I certainly hope the industry is on board with that schedule.

MS. KAMMERER: Yes.

MEMBER STETKAR: Because again, finding analogy on a lot of the fire stuff, you know the industry has constantly said we need to do more tests and because we need to do more tests we have a delay. As long as they're taking ownership of this within the context of this schedule.

MS. KAMMERER: Yes.

MR. CHOKSHI: And this has been -- I think at least in the seismic column that you have talked about for a while, that in order to address this issue, we need a test program. You can't analyze all of these things.

MS. KAMMERER: I think one interesting thing to note is that this program was actually already forming in peoples minds and had been discussed under the EPRI NRC research MOU. We had identified several areas that came out of the ANNUS Pilot study that was done of areas of future collaboration and working on this.

So there had already been a lot thought as to how something like this might happen. And so this

1 particular program in fact is still occurring under
2 the NRC EPRI MOU as part of the overall research
3 program. It's just on a much more accelerated
4 schedule than we'd ever really anticipated previously.
5 MR. CHOKSHI: So I think as far as the,
6 all of the sort of technical discussions and on the
7 policies I am finished but I wanted to bring back to
8 the overall how does this now relates to the ERA.
9 And to me that is important perspective,
10 I want to be about this. So as you talked about the
11 SPID positions and our history of the six which
12 affects both the SPRA and the SMA. They need to be
13 applied first of all consistently echoes both matters.
14 And by doing that and also then now
15 including increasing the scope of NRC-SMA this
16 operation phase and containment functions.
17 And at the same time we're using the not
18 necessarily requiring fragility analysis for all the
19 components in and other things those two approaches
20 are coming together.
21 That's two differences and I think, John,
22 I think you really brought out that margin we are
23 trying, the force is to here to identify components
24 and the why do you want to look at capacity. It does
25 not answer the questions that the sort of the

phenomena that do you log it as LOCA because of the seal or are we starting with that assumption.

That differences still remain but in terms of doing the analysis and the resources those differences are I think for me are coming together.

MEMBER BLEY: As I read an early page in your report you talked about preferring fragility analysis and then a full scope SMA. How did you get there? It's hard to tell the difference.

MR. CHOKSHI: The difference to me you may be able to use analysis, individual screening is also not limited, but you just may have it with pure calculations. And you're looking at a smaller number of less complicated trees. And then small initiators. But the other thing is that hazard is always going to be available so to me that question is now, in the past that was an important question.

MEMBER BLEY: If I think out loud somewhere in here you said, I forget the percentage, but well over half of the people had done EPRI SMAs only two I think you said did NRC. And the remainder did PRAs, I don't know how many that is.

MR. CHOKSHI: Thirty-six.

MEMBER BLEY: That many? If you had an EPRI SMA and you have an updated internal events PRA

I can't imagine why you'd go to the trouble to build a reduced model.

MR. CHOKSHI: I think that's --

MEMBER BLEY: Are you hearing from people what they're going to do?

MR. CHOKSHI: Yes, one of the feedback we are getting from the people is they might as well do SBA.

MS. KAMMERER: Yes really, most of the discussions the industry is coming in with is us is really about the screening. About just doing something, whether it's an SMA or PRA that's not really what, it's can they use their existing models. Can they use things to get screened out.

MR. CHOKSHI: What we hear, all of the technical people basically says you do the PRA, there's not that much. Now whether the decision makers will go along with that we don't know.

MEMBER STETKAR: And I think, Annie, what you said about the screening and what the industries kind of keep that on the screening. How much of that can they use, and what kind of guidance can be provided for that screening.

That's, I think, where you've heard a little feedback from us about if they're going to use

the screening approach there should be some confidence that that screening is appropriately conservative. So indeed it does identify the things that you might want to sharpen your pencil on.

MS. KAMMERER: I'm sorry, I was really unclear. What I meant was the overall screening. In other words did they even have to do, not within a period.

MEMBER STETKAR: Oh, I see, I'm sorry.

MS. KAMMERER: And I meant the structural model. So I realize I just completely said something very confusing. So they're really looking at what are the levels at which they have to do something versus which they're done, you know.

And can they use their existing structural model? That's really where a lot of the discussion is.

MEMBER STETKAR: A different level than what we're discussing.

MS. KAMMERER: Yes, but it's not PRA versus us.

DR. BUDNITZ: Wait, this is Bob Budnitz, there's an important distinction here. In the systems model, we're going to allow them to do something that everybody has always done. And that is if something

is very very rugged like a manual valve, you know, one of those big looks like a steering wheel on it. We just let them screen it out. No problem.

MEMBER BLEY: But you've done that in PRAs.

DR. BUDNITZ: Of course, but we do that with PRA too. But if we screen what we call a strong component it stays in the model if a conservative HCLPF or conservative fragility.

MS. KAMMERER: Right.

DR. BUDNITZ: So it's not screened out, it's just in the model with a conservative HCLPF. That's an important point. And then later if we find out that that conservative thing dominates something then we insist they go back and do it right.

MS. KAMMERER: Sorry, I was confusing getting us back on the topic.

DR. BUDNITZ: So we don't lose anything.

MS. KAMMERER: We got it. We got it. Should we go to the next slide?

MR. CHOKSHI: Yes. I think this is my last slide. Our goal is to, you know, we're working to an issue that is for public comments by the end of August. We think we heard some comments today, we're trying to see what, and also we're getting some

internal comments.

My plan is to reflect those comments to the extent we, some of the things we may not have properly addressed. But the process for going out for public comments my part is to stick with the schedule because we don't get a lot of comments.

And we are going to ask them for 30 days. And then after that, we get the comments, there will be a comment response. What I'd like to do is maybe come back to the committee after that and have they look over the responses so we get your feedback while still we are preparing the finalized sheet.

CHAIRMAN SCHULTZ: And to be a little more specific then, so we can also schedule that off-line.

But just for me to repeat back what I heard you say. What will go out at the end of August for public comment will be the document that we have seen.

And then there will be some changes reflecting comments that you've received from internal staff review. The discussions that we've had today. There's another meeting happening with industry tomorrow.

MR. CHOKSHI: But this one we are not, this is not the reason, we had a meeting on this a

1 couple of weeks back.

2 CHAIRMAN SCHULTZ: Okay. And so those are

3 the types of changes you're going to implement before

4 the end August, and then put for comment.

5 MR. CHOKSHI: Right.

6 CHAIRMAN SCHULTZ: And by the end of

7 September you'll have the feedback from the public

8 comment review period.

9 MR. CHOKSHI: Yes, and my plan is to I

10 want have the fragility by end of October.

11 MS. KAMMERER: There would be some

12 efficiency also because that's when we'd have the SPID

13 as well.

14 CHAIRMAN SCHULTZ: That was my next

15 question.

16 MS. KAMMERER: I think it makes a lot of

17 sense to have you guys look at those documents

18 together.

19 CHAIRMAN SCHULTZ: Where the SPID would be

20 in the form that John was hoping for, stable.

21 MR. CHOKSHI: Yes so then maybe in that

22 group right after we take all this and what we think

23 is a sort of final just wanting all the comments to

24 come back to you. In the end of October beginning of

25 November, and that gives us another three weeks to

address any other comment.

CHAIRMAN SCHULTZ: We'll consider that, they sent it back to you on the schedule for that. It will be difficult to schedule that because of other things are already on the plate.

MR. CHOKSHI: Yes. I think if nothing else we can forward you the documents I think for what is.

CHAIRMAN SCHULTZ: We'll see what we can do. We'll discuss that off-line.

MR. CHOKSHI: So I think that is the end of my presentation.

MEMBER ARMIJO: I had a question going that I didn't hear discussed and it's in the SPID Guide, I guess it's that table on Page 10 of your slides. The issue of the approach for spent pool fuel evaluations. That wasn't discussed but now is that an industry position, that column?

MR. CHOKSHI: That's a very good question, because industry has taken different ways at different times.

MEMBER ARMIJO: Let me finish my question. My question was, what is the position and does the staff agree or disagree or is that contention there not --

MS. KAMMERER: They have not yet provided us a stable position. It changes.

MR. CHOKSHI: Yesterday I read that, but yesterday it looks like they have included something. So this would be a discussion tomorrow. They have gone through several.

MEMBER ARMIJO: You could just give us a hint to where they've been wandering about.

MR. CHOKSHI: Yes, so at one point they said they don't want to address spent fuel pool we can do it later. Now they come back that we don't want to go into structural evaluation but we will look at make up capacity and some draw down.

But they were still, that was one, and they were going back to that steering committee and I haven't looked at it in detail but apparently in this there is some discussion of spent fuel pool. So we can know now what they are deciding.

MEMBER ARMIJO: Okay. So that's a big open?

MR. CHOKSHI: Open issue.

MS. KAMMERER: Yes and just so you know, whatever's in there, and actually I haven't read that section yet, it's not at all been reviewed by NRC staff. We haven't even had an opportunity to speak as

a group.

MR. CHOKSHI: This is a log of, so far we must have at least 25 meetings. We won't have anymore to do without bouncing that back to project manager who handles the logistics.

MS. KAMMERER: Yes.

CHAIRMAN SCHULTZ: Well, the committee would like to congratulate the staff on the level of effort as well as the type of interaction that you've had regarding this topic over the last few months really.

It's proving it's worth with what you've presented today and what you envision to be developed over the next few months.

Are there other comments or questions by members of the committee before I open it to public comment?

MEMBER SKILLMAN: I would like to offer that I think the discussion about mission time in the 72 hours and the stable shutdown state needing definition is good counsel for your team. I believe that will be a lightning rod as this goes out into industry.

MR. CHOKSHI: Yes.

MEMBER SKILLMAN: I thank you for your

presentation.

MR. CHOKSHI: Thanks.

CHAIRMAN SCHULTZ: Thank you. Other comments?

DR. BUDNITZ: No.

CHAIRMAN SCHULTZ: With that I would like to open to the room an opportunity for comment, members in the public or individuals in the room who would like to make any comment. Hearing none.

Members of the public or participants on the phone lines? Any addition comments that would like to be entered into the record? Hearing none, I'll move to adjourn the meeting, thank you.

(Whereupon, the meeting in the above-entitled matter was concluded at 11:37 a.m.)

United States Nuclear Regulatory Commission

Protecting People and the Environment

Draft Interim Staff Guidance on NRC SMA for Use in Recommendation 2.1 Evaluations

August 15, 2012

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Reasons for Including NRC-SMA

- Recommendation 2.1 50.54(f) letter considers use of either Seismic PRA (SPRA) or NRC Seismic Margin Analysis (SMA) appropriate for plant evaluations if hazard screening criteria are not met
- NRC-SMA outlined in the 50.54(f) is an enhanced approach from the original NRC-SMA
- NRC-SMA is a fault-space based approach using PRA system logic but limiting analysis to two seismic initiators; transient and small LOCA
- Approach is capable of providing risk insights and suitable for sites with lower seismic hazard. SMA is not suitable for high hazard sites
- Because of the fault-space based model, the NRC-SMA approach can be easily extended to more detailed PRA type of analysis, if needed

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Outline of the Draft Interim Staff Guidance (ISG)

- Purpose
- Basic Terms and Concepts
- Background, Overview and Issues Related to Seismic Margin Methods
- Staff Position on Individual Technical Issues
- Documentation
- Peer Review Attributes, Activities, and Documentation

Purpose and Applicability

- Supplemental guidance to nuclear power reactor licensees on an acceptable method for performing a Seismic Margin Assessment (SMA) as referred to in the March 12, 2012 NRC letter
- This guidance, at this time, is only intended to be used for an SMA conducted in response to the 50.54(f) letter, and not for other purposes. NRC Interim Staff Guidance (ISG) NRC ISG DC/COL-ISG-020 remains the NRC's current guidance for application to new reactors. The contents of this ISG have no implications for NRC ISG DC/COL-ISG-020, the ASME/ANS PRA standard, or any other document

Background on NRC-SMA

- Seismic Safety Margin Research Program (SSMRP)in late 1970s and early 1980s
- As the SSMRP was wrapping up, ACRS raised the question of actual seismic margin beyond design basis
- NRC formed an expert panel to address the question of seismic margin (early 1980s)
- NRC expert panel addressed easier task and defined the following analysis approaches:
  - review the plant against a specific earthquake level (i.e., SME) and determine whether plant has a high confidence of low probability of failure for SME (this earthquake level is called review level earthquake (RLE) in this ISG)
  - if less than SME, then calculate the plant “high-confidence low probability of failure (HCLPF)” capacity of individual SSCs and ultimately of the plant-as-a-whole

Background on NRC-SMA

- The expert panel used insights from the then available SPRAs as follows:
  - Retained fault-space based approach
  - Only focused on selected functions, simplifying logic structure significantly
  - Introduced screening tables for use in conjunction with the specified RLE
  - Developed min-max approach to calculate sequence/plant HCLPF
- NRC Method published in NUREG/CR-4334 (1985) followed by NUREG/CR-4882 and NUREG/CR-5076
- Maine Yankee trial application, NUREG/CR-4826

Reasons for Enhancements

Reasons for the NRC enhancements for this ISG are as follows:

- To define the scope of analysis needed for information requested in 50.54(f) letter
- To provide staff positions on the major elements of SMA
- To update references to allow use of the recent advances in methods and guidance
- To incorporate references to applicable provisions of the ASME/ANS standard and positions of industry (SPID) endorsed by the NRC

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Staff Positions on Technical Issues

SMA Scope 4.2	• Addition of certain containment functions and systems to assess LERF • HCLPF capacities for core-damage and large early release sequences • Separate analysis of HCLPF capacities of sequences with and sequences without non-seismic failures and human errors • Chatter analysis and treatment of high-frequency response of certain SSCs
Ground Motion and In-Structure Response 4.3	• Selection of the Review Level Earthquake • Soil failures • Development of in-structure response spectra • Median seismic responses of systems and components
Systems Analysis 4.4	• Enhancements to the PRA-type systems SMA model beyond those in the original guidance • “Mission time” for the accident analysis • Selection of the Seismic Equipment List
Fragility and Capacity 4.5	• Plant walkdown methodology • Screening approach and level for of SSCs • Fragility analysis method for evaluation of the HCLPF capacity of an SSC • CDFM method for evaluation of the HCLPF capacity of an SSC
SMA Integration 4.6	• Plant margin evaluation using the Convolution Method for sequence-level and plant-level HCLPF capacity • Guidance on using the “Min-Max” method for sequence-level and plant-level HCLPF capacity

SPID Approach

- Screening, Prioritization, and Implementation Details (SPID) Guide
  - Being developed by industry with NRC input
  - Objective is to be endorsed by NRC and published by November
- Some elements of SPID are applicable to the draft ISG and are incorporated and referenced in staff positions

Screening, Prioritization and Implementation Details (SPID) Guide for the Primary Approach – Fukushima NTTF 2.1:

Category	Reference Number	Position	Figure 1 Flow Chart Reference
Hazard	1	Use of updated EPRI attenuation model	1
Hazard	2	Use of existing site conditions	1
Risk Analysis	3	Use of existing structural models	6a, 6b
Risk Analysis	4	Scaling of responses to develop ISRS	6a, 6b
Risk Analysis	5	Screening criteria for SSCs	6a, 6b
Screening	6	Use of IPEEE HCLPF to compare GMRS for screening	3, 5
Screening	7	Treatment of HF	3, 6a, 6b
Risk Analysis	8	Use of CDFM and separation of variables methods	6a
Risk Analysis	9	Approach for SFP evaluations	7a, 7b
Risk Analysis	10	Overall approach relative to RG 1.200 and ANS/ASME EE standard	ALL
Risk Analysis	11	Consideration of rock founded structures for developing ISRS	6a, 6b

An Example of SPID Approach

Position #2 / Figure #1 Step 1 Bullet 4: Use of Existing Site Information

Position:

- The industry will use available soil/site characteristic information. Utilities have the option to gather further information should they choose.
- Subsurface site response models will go deep enough to characterize the lowest frequency of interest to the structure. (0.3 Hz is industry proposal)
- 30 convolution analyses will be used to define the mean and standard deviation of the site response
- The GMRS to SSE comparison will be performed at control point(s) defined in the FSAR. If no control point is defined in the FSAR, the comparison will be conducted at the highest competent layer.

Justification:

- For the purpose of meeting the requirements of 2.1, the existing soil/site characteristic information will provide sufficient accuracy.
- Subsurface site response models are not needed down to depths that would be necessary to capture responses below frequencies of interest to nuclear facilities.
- Statistical analyses have been done to demonstrate that 30 convolution analyses are sufficient to define the mean and standard deviation of the site response. The technical basis for this is contained in the February 22, 2010 Duke Power letter on the Lee Plant FIRS to the Document Control Desk of the NRC (Docket 05200018, Duke Power letter WLG2010.02-01, ADAMS ML100550350)

Follow-up studies under consideration for incorporation into the SPID:

- Guidance on development of the site amplification factors will be included in the SPID.
- Industry to develop guidance for selecting the control point elevation for screening (GMRS vs. IPEEE HCLPF Spectrum) and for soil/rock modeling for SSI (in layer, outcrop, etc.) for future risk assessments. This will ensure proper identification of required hazard data and locations. Two workshops will be conducted involving several industry experts to formulate a consensus on the appropriate control point and soil/rock strata characterization for screening and for SSI.

Key Positions Under Consideration

RLE:	The RLE to be used in the SMA is the envelope of the SSE and the Ground Motion Response Spectra (GMRS) over the entire frequency range.
Initiating events:	Transient and small LOCA with unrecoverable loss of offsite power
Mission time:	Extended to 72 hrs. or stable shutdown state, whichever is longer
Scope of functions:	Group A functions (Shutdown chain reaction plus injection-phase early core cooling) + emergency core cooling late involving recirculation and switchover phase + containment heat removal + containment over-pressure protection (early) + containment integrity (penetration and isolation).

Containment structural failure modes: Need not be included

Key Positions Under Consideration

Non-seismic failures:	To be included explicitly
Human actions:	To be included explicitly
Screening of SSCs:	*EPRI-NP-6041-SL Rev.1, other recent refs. SPID position (described in detail later)*
Plant walkdown:	EPRI NP-6041- SL Rev.1, ASME/ANS Part 10, HLR-SM-D
Responses:	*ASME/ANS Part 10, SM-C1 to SM-C4 and SPID (described in detail later)*
Seismic margin (SSCs):	Fragility method: Section 5-2.2 of Part 5 of the ASME/ANS Part PRA Standard, also SPID provision of using CDFM with generic β CDFM method: Section 10-2 of ASME/ANS Part 10, EPRI Guidance

Key Positions Under Consideration

High-frequency components :	*Treated through test program (described in detail later)*
Soil failure modes:	To be included as applicable
Sequence/Plant HCLPF:	Convolution approach
	Min-Max method acceptable with justification
Documentation:	As per ISG-20 and position of SPID on sequences before screening of components
	HCLPFs for leading sequences separately for core damage and large release
	HCLPFs for sequences separately with and without non-seismic failures
Peer review:	Participatory review

Key Positions Under Consideration - Screening

Screening of SSCs: EPRI NP-6041- SL Rev.1, other recent refs. SPID position

SEL

Inherently Rugged SSCs

- Generally agreed upon as extremely high capacity
- Not included in model by convention

High Seismic Capacity SSCs

- HCLPF capacity exceeds screening level
- Detailed fragility calculations are not performed
- Included in model with capacity at screening level

Other SSCs

- HCLPF near or below screening level
- Fragilities calculated for SSCs
- SSCs Included in model with actual fragilities

Key Positions Under Consideration

Screening of SSCs –Draft Staff Position

- The components identified as “high capacity “SSCs should be assigned capacities equal to the screening level and retained in the system model
- The screening level may be set as either:
  - A screening level consistent with a HCLPF capacity that is 2.5 times the RLE, or
  - A screening level equivalent to the HCLPF that leads to a frequency of failure on the order of 5x10-7/yr using a mean point estimate.
- Once the SMA analysis has been performed, a check must be conducted to assure that none of the following conditions exist:
  - A “high seismic capacity” SSC (which has been assigned a conservative HCLPF equal to the screening level) is identified as a dominant contributor to HCLPF of core damage
  - A high seismic capacity SSC is identified as a dominant contributor to HCLPF of large early release

Key Positions Under Consideration - Response

Summary of Draft Staff Position:

- Realistic ISRS should be calculated using ASME/ANS PRA Standard Part 10 or the guidance on the use of existing information and models provided in the SPID
- If an existing structural model is used, its attributes should be compared to the criteria in the SPID and its applicability documented and justified
- If scaling of in-structure response spectra (ISRS) is used, its use should be consistent with current accepted practice or the SPID guidance on the use of scaling. The use of scaling should be documented and justified
- Fixed base models may be used for structures founded on rock with a shear wave velocity greater than 3,500 feet/second
- The use of any existing models or data should be reviewed by an experienced structural engineer, and should be subject to peer review

Key Positions Under Consideration - Response

From Appendix A of Draft ISG:

- The acceptability of scaling of responses will be based on:
  - previously developed ISRS
  - shapes of the previous input response spectrum/review level earthquake (RLE)
  - shapes of the new RLE, and structural natural frequencies, mode shapes and participation factors
- Licensee will need to demonstrate/document that scaling of the ISRS is appropriate for the site in their submission to the NRC. Any potential structural issues with the use of scaling should be addressed and justified in the documentation. The use of scaling and the documentation should be subject to peer review, which will also be documented
- Scaling of rock or soil sites where the shape of the new hazard spectrum is not highly similar to the previous spectrum is not recommended without justification that demonstrates the validity of the scaling approach

Key Positions Under Consideration – High Frequency SSCs

- Staff position – utilize industry test results after endorsement
- Industry has undertaken a test program involving two phases

Phase 1:

- Developed a project plan and roadmap incorporating past studies on high frequency effects
- Conducted a workshop to review draft project plan and roadmap
- Conducted workshop to develop and review a test plan
- Will initiate pilot test program to collect feedback and validate project and test plan.

Key Positions Under Consideration – High Frequency SSCs

Phase 2:

- Upon completion of Phase 1, the broader test program will be initiated (Phase 2), including:
- Survey to gather information on types of potentially high frequency sensitive equipment (type, manufacturer #, model, etc.)
- Utilize results from survey and pilot test program to finalize test plan (workshop to review)
- Conduct test program
- Utilize results from test program to confirm adequacy of high frequency input motions for plants that otherwise screen out and for plants that are undertaking further risk evaluations

SPRA for Recommendation 2.1

- The following six SPID positions proposed by industry in conjunction with the use of SPRA apply to the SMA also
  - Use of existing structural models
  - Scaling of in-structure response spectra
  - Use of fixed-based models for soft rock sites
  - Use of the CDFM and Separation of Variables methods for fragility curve development
  - High frequency test program
  - Screening of component
- With the enhancements in the NRC-SMA method and use of the above positions the differences between SMA & SPRA are narrowing
- The challenge with the available resources is related to whether there are enough response and fragility analysts

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Next Steps and Summary

- Issue draft ISG for public comments by the end of August
- Receive public comments after 30 days
- Issue final ISG by November
- Enhanced NRC-SMA is provided as a fault-space based option to SPRA for low hazard sites
- Enhanced NRC-SMA can more easily be extended to obtain risk insights