MR. SATORIUS: Yes, I would agree.

DR. ROSEN: And that's a hard job, but to pick out a few safety systems, high pressure injection, aux. feedwater, on-site power, et cetera, and say those are what we're going to measure makes them surrogates for this much more robust measure, which is a measure of the overall risk of plant operation. They're a stand-in for something we really want to measure, which is the overall risk.

So Mario correctly points out that the real thing to base this on is the PRAs because it would get at the plant specific issues directly, and I say to follow that on that some plants are, in fact, doing that internally. They have to participate in this process obviously, but some plants have risk monitors or risk indices that are based on their configuration risk management programs, which take in all of that stuff.

More and more plants -- the plant I came from had one, but more and more plants now have them and are using them to good benefit, controlling their configuration risk.

I suggest that long term now and in your thinking moving towards replacing individual system unavailability measures with a more integrated measure

based on the PRA gets to the thing we all want to measure, which is the overall risk of plant operation.

MR. JOHNSON: Yeah, let me try to talk to that if I can. I think what I hear and the direction that we're headed in is synced up. I stopped short in my discussion of what we're doing with respect to the safety system unavailability PI to talk about the strongest piece of that enhancement that we are considering with the unavailability PIs, and that is the addition of reliability indicators that are a fallout of the risk based performance indicator program that Research worked on.

And when you have those performance indicators, well, what we'll do is we'll set plant specific thresholds, plant specific thresholds, and so what we'll look at is not a standard unavailability percentage or a standard liability percentage, but we'll look at a percentage that is based on a standard delta CDF, based on the change in reliability or change in unavailability.

And we're talking about doing that in the near term. We're already working on the user -- we've had a number of conversations with Research. They're tapped into this focus group that is working on unavailability improvement. So we're headed in that

direction in the near term, and that, I think, scratches that itch.

With respect to this longer term use of integrated indicator, I'll tell you right now the PIs that we have are surrogates. They are indicative. We've always said they would be indicative, and that's where we were when we started this program, and that's as far as we've been able to come.

Although if you look down the list of the things that we're asking for and the things that are on that risk based performance indicator task, development task that Research has briefed you on in the past, I know one of those things is an integrated indicator.

And so in the longer term, I think in the longer term there is some direction towards seeing if, in fact, there is a capability to add something like that.

Now, I think there's some philosophical things that we need to get beyond before we adopt something like that. I think right now we're more comfortable given the limitations, given where we are in the development. There is more comfort with this indicative approach, this selection of a few systems that are surrogates for the overall state of the

performance of the plan, but that's certainly on our developmental longer range, the use of what it is you're suggesting.

So, I mean, I think this is a good area where we're actually moving in the direction that ACRS would indicate is a good direction for us with respect to the performance indicators.

DR. SHACK: Let me take a slightly different approach that's different than my colleagues. I mean, most of my colleagues look at this as sort of a gigantic risk meter, that you know, we clock in every once in a while, and I like that approach because it sort of gives you kind of a unifying thing.

Whereas I look at some of these performance indicators as surrogates for ways to measure things like safety, culture, and that, you know, even though my Westinghouse four loop plant could take lots of unavailability in the high pressure injection system, it's not a good sign that you don't keep the system up and operating.

And to my mind many of these indicators, you know, if I base them on risk, nothing will turn out to be safety significant. You know, everything is unimportant until the accident happens, and there's

some measure of attitude here that is kept in by looking at something that measures performance rather than risk.

But that leads to sort of fundamental problems and inconsistency because the significance determination process is risk informed, and yet some of the other PIs I can look at as measuring some other kind of parameter, and that leads me to logical inconsistencies, although I'm almost happier logically inconsistent than I am purely risk informed at the moment.

(Laughter.)

DR. POWERS: I don't understand that. What's the conceptual difference between the two?

CHAIRMAN BONACA: Yeah, I really think that, no, the fact is that could be something that you could construe that if, in fact, you put the threshold so close to an expected performance, that you step over the bound because you're sloppy about it, right? So you're measuring culture.

But you're not because you're putting the threshold far enough that you capture only certain cases where, you know, just you capture maybe one or two out of 100. So the measure is --

DR. SHACK: Well, some of these plants,

and I set them on a consistent delta CDF for all plants, some plants would have enormous tolerance, and some plants would have much narrower ones.

CHAIRMAN BONACA: The fact you have a question that says do they provide meaningful insights into aspects of plant operations that are important to safety, and you know, again, I don't think that you get insights on the culture from the PI because, I mean, you will see variations of that. I mean, otherwise you would see some kind of grading variation.

But certainly you do not get insights that you have from existing risk assessment tools regarding through the PIs. I mean, you don't get those because they don't differentiate on what is important for the plant and set certain criteria on what is important for the plant.

In fact, I dare say that if you had a full understanding of that through PRAs, you may have different sets of PIs for different plants. I mean, you could have that.

DR. ROSEN: This is the old structuralist versus rationalist approach, and I'll come down in between, and I'll be a rationalist with structural tendencies.

Really having a fully integrated risk unavailability or integrated risk monitor would be a very good thing, and I think you should work to it, but that's not throwing out the structural aspects, the points that Bill was making, that Shack was making.

CHAIRMAN BONACA: No, I'm not throwing them out either.

DR. ROSEN: Because we have a risk informed program here where we use risk to the extent we can, but we have to be thinking about the fact that the safety culture at the plant is a leading indicator of what these things are.

I mean the safety culture goes downhill before you ever see these numbers start to change.

CHAIRMAN BONACA: Yeah, and in fact, you know, the inspectors have pointed out that if the thresholds are too far, they don't count enough to, in fact, identify trends like they should. So they stated that actually the thresholds are allowed.

DR. SHACK: But I think risk information, I think, will move you even further away from or at least that's my concern. I don't know the --

DR. ROSEN: I don't think so. I think risk basically would move you further over, but risk

informing swings you back. It brings you back to the middle where it says we have to take into account the safety culture.

And I suggest that it's a timing difference, that the perfect plant has a great safety culture and very low numbers on its indicators, but when it begins to degrade, it degrades first in its culture and then the indicators begin to follow it, will begin to follow it because, in fact, the plant's hardware starts to reflect the degraded maintenance of whatever else.

MR. SIEBER: But the emergence of a declining safety culture, which is a cross-cutting issue even though it shows up as indicators, the indicators respond, demonstrate perhaps a cross-cutting issue is involved because you've already built in a lot of latent defects.

And I think that that is part of Bill's concern. You know, if you had ten -- if I had safety injection pumps and five diesel generators for a single unit, you would say that's pretty safe.

If you have a really lousy safety culture, probably half of the stuff doesn't work. So I would just assume you look at individual competent declines.

DR. POWERS: I wonder if you could speak

to those performance indicators that usually aren't associated with any risk metrics, thinking of things like the safeguard performance indicators and whatnot, and in particular, I would appreciate it if you would speak to it in the context of providing -- whether those performance indicators provide meaningful insight and aspects of plant operation that are important to safety.

MR. JOHNSON: Tom, why don't I let you start and then I'll add?

MR. HICKMAN: Did you want me to start or you said you were going to start?

Okay. The --

DR. POWERS: This question was so easy he asked his chauffeur to answer it.

(Laughter.)

MR. HICKMAN: Right. The indicators in the other strategic performance areas are difficult to associate directly with risk, as you know, and so what --

DR. POWERS: But I'm not asking you to associate them with risk. I'm asking you to associate them with safety.

MR. HICKMAN: Okay. Well, I guess you could say the same thing interchangeably there.

They're associated with performance in those areas which have some sort of impact upon the safety at the plant, but it's hard to tie any kind of number with that, and that's the reason that those indicators don't have red response -- red bands.

What we've done in those areas is to use basically expert opinion to determine expert panel type of approach to determine when indicator values are to have reached a level where the NRC ought to step in and take action.

In establishing those thresholds, as I said, we did that with an expert panel, we confirmed those based upon the results of the pilot program, the six month pilot program and also the results of the initial historical data that was provided by all licensees prior to initial implementation.

And what we discovered was that the expert panel process worked very well, that, in fact, we had established levels that seemed to be very appropriate, first of all, at the green and white level for identifying outliers. That seemed to work very well.

As far as the higher color categories, colored bands, as I say, we just have the yellow. There's nor ed for those. Again, that's based upon the expert panel opinion that those are the levels

where we need to take increased action to prevent any further decline.

In some of those areas, of course, licensees have to maintain those programs, and so it's not acceptable to say, you know, the program is broken in that regard. What we have to do is make the program work.

So at the yellow band level, the NRC will step in and take whatever action is necessary, whether it requires orders or anything, whatever it takes to make sure that the program works.

That's the process behind the development of those thresholds.

DR. POWERS: I think what I'm really asking you, if you could give me a thumbnail sketch of the rationale the experts use to arrive at the conclusion that there was some level where the NRC had to take increased action to make the program work.

MR. HICKMAN: I'm not the expert in those areas, but I can tell you briefly what I know about what they did. It was based primarily on their experience in the emergency preparedness area, for example.

They had a lot of experience with the number of drills that were being performed by

licensees and the amount of participation that was involved in those.

Actually in that cornerstone or that -- yeah, that cornerstone, we achieved, we think, quite a success because it caused licensees to do exactly what we wanted them to do, to run more drills and put more people in it.

And the thresholds were established based upon their experience, and they turned out to be very good, very close.

With regard to the other cornerstones, the performance indicators in the public radiation safety, for example, are not likely to be exceeded. The industry has performed pretty well in those areas, and it would have to be a series of serious breakdowns at the plant for them to be exceeded, and those are what are used in the public radiation safety area.

The safeguards area, we still have some concerns about that, and we're still working on that, but the security performance index has worked well and has had some success in causing licensees to fix system that they had not paid much attention to in the past, although we're still working on that. There's still a lot of concerns about the security equipment performance index.

And there's likewise concern about the other two indicators in that cornerstone.

DR. POWERS: Can you give us a thumbnail sketch of what your concerns are?

MR. HICKMAN: In the safeguards?

DR. POWERS: Right.

MR. HICKMAN: One concern, I think, was that the security equipment performance index was probably not worded quite right. It claims to monitor the unavailability of the security equipment, and in fact, we don't really do that. We look at the compensatory hours, guard postings in compensation for degraded equipment.

And so it doesn't really do what the words seem to imply that it does because we use a surrogate. We posted guard hours as opposed to actual unavailable hours for the equipment.

That was done because it's easy for licensees to collect that data. It's more difficult to keep track of the actual unavailable hours.

DR. POWERS: I guess one of the questions that the licensee can legitimately ask is, "Gee, I've discovered I've got a piece of equipment," right? Pieces of equipment break. He discovers it Friday afternoon. He does not have a replacement part.

He takes compensatory action for it. Everybody agrees that it's compensatory action, and yet he has -- he gets a degradation of this while he's waiting for a weekend to get over, and then on Monday he can call and get the replacement part that he wants.

Why should that be a degraded action? It seems to me that's a victory for him. I mean, he should get a gold star put next to his name on that one.

MR. HICKMAN: We've heard that type of comment, actually maybe even a little more intrusive into licensee performance, the case where that happens and they have the part, but they don't want to have to call the tech. in on the weekend and pay them extra money to fix it when they can fix it on Monday, and that issue has been raised by licensees a number of times.

I guess the answer to that is that the threshold is set high enough to accommodate some of that type of activity. Plus, there are exemptions in the indicator. There is a blanket exemption for preventive maintenance.

So we're encouraging them to fix the problems before they break and you won't count those

at all. But there is allowance. The threshold is at eight percent. So there's a certain amount of that kind of problem that can occur, and it still won't cross the threshold.

MR. JOHNSON: Yeah. I mean, I think John has given the answer that I wish I would have been able to give right off the cuff, but that's why I rely on Don.

Two points that Don made that are really key. One is if you talk to NEI and ask them about performance indicators that are working well, they'll point to the EP performance indicators and they'll talk in some cases about this security equipment performance index, and it's because of what Don said, and it is causing licensees to take actions in areas to address performance problems that really ought to be addressed.

With respect to EP, in fact, if you have problems, adverse trends in your performance, if you're not, in fact -- and you want to improve that performance, if you want to improve your participation and improve your drill performance, what do you do? You run more drill sand you perform better at those drills.

And that's what we want with respect to

performance indicators, and in fact, we've found instances where plants were not performing as they should have been performing with respect to EP.

Just to take you back on it, the second point I'll make is remember the development. The development was we said what are the cornerstones; what's the important information that we need about those cornerstones; and so what can we get from performance indicators; what can we not get from performance indicators? So we need to do baseline inspection, and so remember performance indicators are only a piece.

But there is a nexus. In fact, the performance indicators, we believe, do have face validity in that they do tie back to giving us insights on those key attributes that we need to measure in each of the cornerstone areas.

And so as Don points out, we need to do more with both, with the security equipment performance index. With 7355 rulemaking, we know we're going to need to go back and look at those safeguards performance indicators, to improve them, to make them more consistent conceivably with how that rulemaking comes out. So we know we've got some work to do.

But those performance indicators also give us good insights in an indicative kind of way with respect to performance of the plant in those cornerstones.

MR. SIEBER: Every indicator refers to one of the seven cornerstones in the framework. I presume unplanned power change is initiating event cornerstone.

MR. SATORIUS: Yes, it is.

MR. SIEBER: Is an unplanned power change risk significant at all?

We used to change power to reduce radiation dose so we could have containment entry. Is that a risk?

MR. HICKMAN: Do you want me to answer that?

MR. SATORIUS: Yeah, go ahead.

MR. JOHNSON: Why don't you take that?

MR. HICKMAN: No. In fact, we say in the guidance document, in 99-02 that unplanned power changes in themselves are not risk significant, but under other circumstances, they could lead to risk significant events.

The reason that the staff is interested in unplanned power changes is because historically we

have noted a relationship between plants that are constantly going up and down in power and the plants that in previous assessment process we identified as poor performers or watch list plants or declining trend plants.

And we've seen the plants that tend to run steady state are also safer plants.

What we're counting, that indicators, not just any power change, but it has to exceed 20 percent. So for smaller power changes, we don't pay attention to those, but we're counting those that exceed 20 percent of full power.

MR. SATORIUS: I might add to that the scram PI falls into that same category, that it's traditionally a PI that under previous assessment --

MR. SIEBER: It's not risk significant.

MR. SATORIUS: Right, but it matches up in the past that plants that are scramming at lot, the same as plants that are up and down a lot in the past assessment process had tended to be poor performers.

MR. HICKMAN: And one other important thing there is. The threshold is high on that indicator. We understand that there's going to be some of that, and we allow for that.

MR. SIEBER: Well, I worked at a plant

once that did load following, believe it or not. Are they exempt from this PI?

MR. HICKMAN: Yes. There are a number of exemptions, and that's one.

MR. SIEBER: Okay.

MR. JOHNSON: You'll find that discussion in 007. We do a pretty good job of laying out why we chose, for example, the unplanned power changes, and it goes to what Don said.

MR. SATORIUS: I'm going to go ahead and go to the next slide, and didn't have a lot that we had intended to discuss at least in this presentation on assessment. The first bullet, I think, ties into the discussion we had just had under PIs, and that has to do with, you know, consistent responses to PIs and inspection issues and our endeavors to assure that the information we're gathering through the PI process is consistent with the system that we're using to evaluate safety and risk significance with inspection findings., especially the disconnect or the potential for the disconnect where you may have, because of fault exposure hours, had a PI that goes red and at the same time if it had been an inspection finding and there was an SDP associated with it, it would more than likely be green.

So we've identified that. We're working towards that through the safety system unavailability working group, and as I had mentioned, in the interim we intend on for demand failures within the PI arena to use an SDP to analyze that risk significance and apply a color.

The second thing we wanted to discuss real quickly was an issue involving no color findings.. When we briefed the subcommittee, I believe it might have been in May. We went through our rationale for no color findings, and my recollection, there was quite a bit of dialogue because for us to explain to the subcommittee our bases for no color findings and where did they fall, are they in between green and white, are they less than green, and we've kind of concluded based somewhat on our interaction with the subcommittee at that time and also with some interaction that we've had, I guess, primarily with some other offices within the headquarters and also with the regions that it just confuses matters.

MR. SIEBER: It certainly does.

MR. SATORIUS: You know, I've heard anecdotally that no color to some folks made no sense, and for the guy walking down the street, you ask him and if I tell you I have four color and something

called no color, where would you plug that in?

So we concluded that the best approach here would be to just call these matters green and go on, and so that's the direction we're headed on that.

MR. SIEBER: Well, that's one element of at least the public confusion that the color system has, you know. You have green, white, yellow, red, and then you have a different color, which I think is gray.

MR. SATORIUS: It is gray. It is gray if you go to the Web site.

MR. SIEBER: If you didn't inspect them at all, and there's a pink or magenta color that says I inspected it, but didn't have any findings.

And so when you look at this you need to, as my computer has it, 256 colors to be able to figure out what's going on.

MR. SATORIUS: And we recognize that, and it's going to require some procedural changes because in the past by colorizing an inspection finding, that suggested it passed through an ADP, and these no color findings are traditionally issues that may fall within traditional enforcement or do not fit within an SDP, and we need to change our guidance to reflect that.

But we think that the better view here is

just to call them green.

MR. SIEBER: Good.

MR. SATORIUS: It makes sense.

MR. SIEBER: I think another element of potential public confusion is that people generally associate green with good, whereas green is not good. It's bad because now you've actually found something that has to go into the corrective action system.

DR. WALLIS: Green one is good.

MR. SIEBER: I think that the purple, magenta, pink is the best.

DR. POWERS: I think there's some advantages to being color blind because the more appropriate thing is that these no color findings are within the licensee response band, and I mean, that's the definition, and that's what you intend, and everything else seems to make sense to me.

MR. JOHNSON: That's exactly right. That's what we're doing, is we're saying those are licensee response band findings.

I can't not react to your green is good or whatever. You know, with respect to a performance indicator, as Graham is pointing out --

MR. SIEBER: Green is good.

MR. JOHNSON: -- green is okay. If you

have green, if you're in the green band with respect to scrams --

MR. SIEBER: But we're talking about findings here.

MR. JOHNSON: -- that's a -- but if we're talking about findings and we're talking about everything that we find that is a green needs to go into licensee's corrective action program, and so there is that sort of difference in the explanation that we've tried to be careful to make, and we continue to have to live with based on the scheme that we've set up.

MR. SATORIUS: Okay. Doug, you're up next.

MR. COE: SDP is a first up. The SDP has, I think, been acknowledged by man as one of the more significant differences in the new program versus the old program, and it was born of a need to address the concerns of our stakeholders that we be more consistent and more objective across the nation, across the different regions and across time with our assessments of performance.

And so given that we have seven cornerstones, some of which are amenable to a risk kind of evaluation and some are not, the overriding

objective for the SDP is one of objectivity and consistency.

In the implementation in the first year of the SDP processes, we have had some issues come up that we know that we need to deal with, and we are dealing with them. The first here, as indicated, is that we need to do a better job of being more clear about the assumptions that we are using to exercise the SDP logic, be that in the risk informed SDPs or in the others.

In any case, it was always our intent that our basis for our decisions be clear, more clear than they had been in the past, and so we do need to do a better job of in some cases documenting the assumptions that we use.

The other thing that has become a significant issue for us is timeliness. A recent audit that was performed based on the 20 issues that have been brought to our headquarters panel between April of 2000 and February of this year indicated that the average time from the exit meeting to the final panel results was about 98 days, and as you're aware, I'm sure, the Commission has pretty much mandated that we set a goal for ourselves of 90 days absolute. That's not on the average. That's not a median.

That's absolute.

So we have a good deal of work to do to improve the timeliness aspect, which certainly is our intent because it needs to support the assessment process, which is conducted on essentially a quarterly basis, if not a continuous basis in some respects.

DR. POWERS: So then your objectivity criterion for this, you've done an internal assessment and an external assessment. You're getting yourselves real high scores on that objectivity?

MR. COE: Well, I would say that relative to the previous program, yes.

DR. POWERS: Yeah, relative to the previous program, right.

MR. COE: Relative to the previous program, I think, clearly the use of risk metrics, for one, sa a means of achieving greater consistency from plant to plant, from region to region, and from time period to time period is certainly giving us a better and more visible yardstick of measurement than when we had in the past, which was essentially a more subjective SALP criteria process.

And the point that was made earlier is a valid one, that the non-risk informed cornerstones, the ones that are not amenable to the use of risk

analysis directly, we have to make judgments regarding the responsiveness or the level of engagement that we would expect to have and seek to measure that or to grade that in a way that remains consistent with the other cornerstones, the risk informed cornerstones.

So from the standpoint of objectivity, I think being clear about our decision logic and employing the same decision logic from issue to issue as we encounter across the regions and across time, I would have to say -- and I think we said this in SECY 01-114 -- that we have achieved a greater objectivity.

We also have continuing challenges in the risk informed arena to continue to improve the Phase 2 notebooks which are the primary implementing tool that is in the hands of the inspectors and is intended to provide them with the ability to improve their understanding of the risk drivers at their plants on a plant specific basis and to make an initial screening kind of assessment of the potential risk significance of the findings that they may come up with.

We are continuing to --

DR. POWERS: Do all plants have Phase 2 notebooks?

MR. COE: We have -- all plants will have

Phase 2 notebooks issued in Rev. 0 form, we think, by the end of September. We have the last three that Brookhaven completed for us. We've reviewed, and it remains for them to complete revising them in accordance with our comments, delivering them to us so that we can put them out via letter and then to the Web page.

DR. POWERS: I'm not sure what phase zero or whatever it is you called the format means.

MR. JOHNSON: You referred to a Rev. 0.

MR. COE: Revision 0 is the first official issuance of the Phase 2 notebooks for each plant or each plant type, and you know, we expect that there will be further revisions. We know that there will be because as we have issued Rev. 0 and have gone out to do benchmarking against the plant's own internal PRA analysis, we are finding that we need to have some changes made in order for the notebook to better represent that plant's design and operation.

DR. POWERS: At what point will you be able to say all plants have these sheets that have been benchmarked?

MR. COE: Well, we've only been able to complete about eight benchmarking trips, I believe, this year, fiscal year, but we are budgeted to

continue that process next year.

The short answer to your question is I think it will take us into probably fiscal '03 to present all plants at the current rate.

DR. POWERS: Is it a case of if you had twice the budget you could do it twice as fast, or is this nine women can't make a child in one month sort of situation?

MR. COE: Certainly I've been told that having a greater amount of money would improve -- we could accelerate the rate at which we do these benchmarking trips. However, you would eventually be limited by the staffing. Okay? We have to have the right people out there.

Typically we invite and get the senior reactor analyst in each region to participate in these. We think that's valuable for them as well, and I think that's pretty much been the case for the ones that we've done so far.

So, yes, we could accelerate it with greater funding, but there would be a natural limit. I'm not sure exactly what that limit would be.

MR. SIEBER: It's my understanding that you don't have an operable SPAR model for every unit. Is that true?

MR. COE: SPAR models are also under development, and I don't know exactly where we stand, but the recent, most recent development program estimates given the budget and the funding that have been asked for, but maybe not entirely approved yet, would have us completing all of the SPAR models out some time in fiscal '04, I believe.

MR. JOHNSON: And that's SPAR-3, I think.

I was actually looking for Steve Mays and he's not around. Tom, do you have?

MR. BOYCE: Forty-three SPAR models have been developed so far. Seventy are supposed to be completed by the end of FY '02.

MR. JOHNSON: You've got to go to the mic. And give you name and then --

MR. BOYCE: Tom Boyce in the Inspection Program Branch.

I'm going to try and relate the status that Research really should be telling you, but Steve Mays did just depart, and the most recent data that I've heard is that 43 SPAR models have been completed out or 70 total. The remaining will be completed in FY '02. They also have to go through a benchmarking process, and only on the order of five have been benchmarked up to this point.

They're doing them in conjunction with the SDP Phase 2 notebooks where possible using the SRAs in the regions.

DR. POWERS: No one has ever --

MR. BOYCE: That process takes time.

MR. SIEBER: Well, let me follow up my thought. The last number I heard was 37, but that was a couple of months ago. So you've made progress, but if you lack a functional SPAR model and you don't have a Phase 2 notebook, how do you do significance determination? Are you relying on the licensee?

MR. COE: In many cases we will ask the licensee for an analysis and we will review that analysis, but I would hasten to add that, you know, the Phase 2 notebooks are out there as high level representations. They lack the details of the SPAR models.

MR. SIEBER: Well, it's screening, right? The purpose is screening and to knock out the nonsignificant stuff at the local level.

MR. COE: It's screening, but even in the final revision, even after we've done the benchmarking, you know, the intent is that the notebooks provide essentially an opening assessment, an initial opening assessment of what we believe the

risk significance might be for a finding.

That can certainly be modified as better information is made available to us, but in many cases we're finding that the inputs that we make to the licensee's models are being reflected properly in the notebooks, in the use of the SDP Phase 2 level process.

MR. JOHNSON: I guess I get a little nervous about our answers that we're giving that research ought to be more appropriately given. Keep in mind that research does ASP analyses on any plant, every plant based on the SPAR-2 model, and we're talking about the SPAR-3 model, and --

MR. SIEBER: Well, that goes back to the senior reactor analyst, the SPAR-3, right?

MR. JOHNSON: So I guess the point I want to make is don't -- if you have continuing questions on where we are with respect to SPAR models, and some of the agencies' priorities are changing based on direction from the Commission, as you're probably well aware, with respect to that, I'd ask that you hear from research and not my group on the final answer.

MR. SIEBER: I guess the bottom line of my last two questions is if you don't have a Phase 2 notebook, you don't have a Phase 3 SPAR model, then

you may be in a weak position with regard to dealing with the licensee because you're relying on the licensee's information

MR. COE: I think one of the advantages of what we're doing with the use of risk analysis in the SDP though is to avoid this issue of my model is better than your model.

MR. SIEBER: Right.

MR. COE: What we're trying to do, and it's been my observation over the past six or seven years that I've been engaged in the risk analysis business that the primary impediment to furthering the use of risk analysis in this agency, and many others perhaps, is one of communication, and if nothing else, the SDP process should be helping us open up the methodologies, the analytics, the assumptions of a risk analysis and make them more apparent and more visible to a wider number of stakeholders, principally those who are closer to the plant, to the physical realities, to the physical design, to the physical operation of a plant who can either, therefore, accept or challenge those assumptions, that logic that goes into this analysis, which produces a result that we act upon.

And so I think that although we're in our

initial stages of improving our ability to communicate with each other and with our licensees and with our public, we are progressing in that direction. At least at the moment, I think we are, and I do hope to avoid the situation that you've just articulated.

MR. SIEBER: Well, one of the interesting things is to my knowledge, there's no regulation that requires a licensee to have a current PRA.

MR. COE: That's true.

MR. SIEBER: And so it's possible you could run into a situation where you don't have the information and the licensee doesn't have the information, and the process to me becomes pretty arbitrary.

And while you're in the process of coming up with a decision as to what color a particular finding is through SDP, it becomes invisible to the public as to how you got there.

DR. ROSEN: You see, Jack, that's the point of having a good SPAR model or good Phase 2 notebooks. For the case where the licensee is very weak in his own PRA development, I think that's a very useful and necessary thing for the staff to have.

On the other end of the spectrum though, with a licensee with a very robust PRA that's highly

documented and very open, why does the staff even need these Phase 2 notebooks and SDPs?

The right answer, it seems to me is when a plant like that has an incident or a finding, you go to their PRA staff, sit down, and at a clean table discuss how the risk analysis would evaluate the circumstances and come to some kind of joint conclusion that both sides can support.

I've seen that process work at the place I used to work at, and I think that's superior to your model versus my model. There's only one model. It's either right or wrong, and both people have access to it.

MR. SIEBER: I think for public confidence --

DR. POWERS: PRA is just not at that stage yet, and there can be two, three, four dozens of models of a plant which are equally right. PRA is just not an exact science yet.

DR. ROSEN: I didn't say it was an exact science. I just said that having one model that both sides, the regulator and the licensee, can agree is the best shot at what's right and evaluating a given set of circumstances using that model is, it seems to me, the way to go rather than one side having some

kind of little simplified model and the other side an advanced model.

DR. KRESS: I think that there are regulatory uses for these things that you wouldn't want the staff to have to run to the licensee every time they wanted to do some sort of risk determination. So I think there's good reasons for the staff to have their own models.

MR. SIEBER: I think so, too, public confidence.

DR. POWERS: Just the capability that the staff has when they have their own model is what's worth the investment.

MR. JOHNSON: Yeah, we're fully supportive of the agency's continued SPAR-3 development, and in fact, even though I don't speak for our office with respect to the priority and certainly not the research in terms of the agency's priority on SPAR, we recognize that it's the way we want to go because we don't want to be overly reliant on licensees.

As Doug indicated, and in fact, I missed some of the conversation, but I wanted to make one last point, and that is, you know, there are two opportunities for us to reconcile the significance of findings for the SDP. One is through the SDP process

itself in our Phase 2 and Phase 3 analysis, and then we provide that information in terms of preliminary analysis to the licensee, and the licensee runs their model, and we reconcile where we ought to be based on the input that we get from the licensee.

But we have a second opportunity, and that is through the use of the ASP program, and in fact, research checks each of the analyses that we do where we have a greater than -- in fact, a greater than green finding. They'll compare what they come out with respect to the ASP, as part of the ASP program, of course, they do the analysis using our models, and then they share with the licensee and they get licensee input.

And so we reconcile those differences and look for holes or areas with respect to the Phase 2 work sheets or the process that we have that may be causing those holes.

So there are a couple of opportunities and a number of exchanges with us and licensees, but I do not want you to leave here with the perspective that we feel like we're overly reliant on licensee models because that's just not the case.

Having said that though, we do think that SPAR-3 development ought t continue.

DR. WALLIS: Could you explain to me what a Phase 2 notebook is? Is this Phase 2 notebook the paper document with all kinds of check marks, or is it a computer into which you can put various information and reach conclusions based on some software?

MR. COE: No, it's the former.

DR. WALLIS: And eventually it should hopefully be something like the latter.

MR. COE: There's thought being given to creating a user interface to the SPAR models that look very similar to, you know, the way that the analysis was represented in the Phase 2 notebooks.

One of my principal concerns from the very start has been that it's often too easy for inspectors in the field to pass their findings off to specialists, risk analysts, and if they don't engage themselves in the process in some form of risk analysis, they tend not to understand the results of the specialists.

And so one of the distinct advantages of a Level 2-like approach for risk analysis is that it helps the inspectors understand both the benefits and the limitations of a risk analysis, and it gives them the opportunity to explore sensitivities of various assumptions that they are in control of, and rather

than let an analyst be in control of the assumptions and the logic that tend to drive the results, this puts this information and the ability to manipulate those assumptions and that logic in the hands of the people who will then, you know, presumably have an opportunity to accept greater ownership of the end result.

So, I mean, in fact, one of the questions that the committee might wish to consider in terms of your letter would be whether or not a three phase kind of approach for the risk informed SDP is worth our continuing development. In other words, you know, one of the options we had was to simply have all of our inspection findings sent off to an army of risk analysts.

That didn't necessarily help the inspector better understand or guide their future inspection activities, nor did it allow for a greater population of individuals who were closest to the plant to participate in achieving either acceptance or being able to challenge the various assumptions that were being used.

DR. POWERS: It seems to me that one of your biggest headaches that I would worry about in the future -- I don't know that you have it -- I would

worry about in the future is the frustration of the inspector seeing things and not seeing anything come about it.

I mean, right now already he's in the position of finding things that don't even go into -- well, I guess they allow him to write on a report now, but they don't seem to go anywhere, and you get this problem of what good am I doing here, the thing I have to do.

And similarly, sending things off to an army of analysts only makes that problem worse, it seems to me. I mean I think you've got a real morale problem brewing among your inspectors if they continue to get isolated as a cog in this system that you've set up.

MR. COE: Exactly, and I feel the same way. My emphasis has been from the start, has been to give the inspector the tools that they could use to find the most significant issues that might exist at any given site.

Now, admittedly, using the risk method that we're using for reactor safety issues, you could arguably say that we've set the bar higher because there is a definite objective bar that has to be met, and the attendant basis that we have to provide to our

stakeholders to say that we've met that limit or that threshold to carry an issue forward into a greater than very low significance manner, apply it in that manner.

But in addition to setting that bar higher, we've given the inspectors the tools to help them see how issues might get to that point, and in the ultimate analysis, I believe that that's risk informing our inspectors.

So, again, I think if you have thoughts on that, you know, because there are multiple ways of pursuing a risk based estimate.

DR. POWERS: Well, I mean, anything that leads to the inspectors understanding that they are essential and that, in fact, their role has been upgraded, not downgraded, is to my mind the way to go.

MR. COE: Precisely, and I would agree.

Next I would just offer that we are continuing development work in the areas of shutdown SDP, which is kind of at a Phase 1 screening checklist level at the moment, trying to develop some Phase 2 kind of sequence based tools.

Containment which has always been kind of a place holder in our current program based on some work that research has done for us, and we need to

carry that work forward and produce a more usable tool, and in the fire area, of course, which we've talked about at some length before, and we all recognize the nature of fire analysis, risk analysis, is probably one of the more difficult for us to tackle.

DR. POWERS: I would like to pursue fire just a little bit.

Go ahead, Jack.

MR. SIEBER: Well, I was just going to comment on that. When I look at the SDP process for fire, it is so simplified that it appears to me to be pretty subjective, to say the least. I mean, you've got a choice of three. It's really bad; it's not too bad; or it pretty good.

DR. POWERS: That's the part of the SDP that I just do not understand at all, is that we have this rather mysterious set of numbers that I actually think I know where they came from. I'd love to hear somebody defend them, but be that as it may, how I select which number to use seems to be totally up to whether I'm a buddy with a guy that I'm inspecting or not.

MR. COE: Well, I would certainly say that we have acknowledged the need to be more specific

about how to characterize the various classes of the parameters that we use as inputs to that fire analysis. One very important one that tends to influence it a lot, influence the outcome a lot is the performance of the fire brigade, and we've acknowledged that there's a need to clarify that guidance so that it's more consistent.

And I can't explain exactly where each of the numbers came from, but what I can tell you is at a high level, the fire protection SDP as reflected in Appendix F of our guidance document 06-09 is essentially attempting to have about the same level of detail that the reactor safety Phase 2 SDP has tried to hit, and in fact, it's linked to the reactor safety Phase 2 SDP.

But what we're really trying to do across the board, across all of these risk informed SDPs is to de-emphasize the numerics and emphasize further the choices that historically and traditionally have been made by risk analysts and to put the thinking, the judgment of choosing those various assumptions more directly into the hands of the inspector.

DR. POWERS: How do I decide that something is low, middle degradation or high degradation? I mean, explain to me how I pick that

number other than the fact that this guy's a good buddy of mine. I know he's doing the right thing versus this guy is a penny-pinching, cost cutting dude. I'm sure that he will not do the right thing.

MR. COE: Well, first of all, I do have a greater confidence in our inspection staff that they wouldn't lose their objectivity in that manner, but that doesn't mean that we can't improve that guidance.

You're absolutely right. I mean, there is a need to be better and more consistent, I should say, in terms of making sure that one inspector will judge a particular condition that they see in the same fashion as any other inspector in another region or across time.

DR. POWERS: If that's your objective, that's a good one.

MR. COE: It is.

MR. SIEBER: I think there ought to be another one, too, that whatever the outcome is, whatever the color of the finding is ought to reflect true risk significance potential for fire because that is a prominent actor in reactor safety.

DR. POWERS: I mean, your priority on fires has gone way up based on the IPEEE insights to

my mind.

Now, let's go to the numbers in the SDP. I assume they come out of five. That's my guess.

MR. COE: And now you've just gone beyond my level of expertise.

MR. JOHNSON: We, in fact -- Matt, I can't remember what briefing it was, which of the briefings it was where we talked specifically about --

DR. POWERS: The one I was not at.

MR. JOHNSON: Yeah, it was the one you weren't at, but I guess what I would offer is if you do have some detailed questions, Dana, that we don't have the right folks where to deal with that. At that earlier briefing we had the branch chief and the section chief and we had the guy who implements the SDP for us now, and in fact, we had the guy who developed the fire protection SDP, and those are really the guys who ought to be answering your detailed questions, I think.

CHAIRMAN BONACA: I had a question.

DR. POWERS: The question is very simple, and it explicitly addresses what the Commission has asked. It's asked do these have any relationship to safety, and so the question is very simple. What do the numbers coming out of five have to do with fire

risk. Why those numbers and not some other numbers?

MR. COE: Well, I can tell you that one of the significant issues that's being dealt with right now is the issue of fire initiation frequency because that does vary, and that does tend to be a significant driver.

And from the standpoint, you know, of what does this mean and how does it relate to safety, you know, again, we're still using the same risk metric, and it all boils down to whether or not the assumptions and the logic that you're using to arrive at your metric -- how well that comports to the actual plant design, the deficiencies that you found, and the way that that plant is operated.

So, again, doing a better job of defining how to use the fire initiation frequencies and what values are most appropriate for various situations, how we define the levels of degradation for fire barriers, for the fire brigade performance, and making that more consistent from inspector to inspector is really our intent.

And what we believe is that the closer we get to establishing that those inputs most accurately reflect the plant's condition gives us greater and greater confidence over time that that risk output,

that metric is reflective on a comparative basis from issue to issue across different plants so that we can grade our inspection responses accordingly.

DR. POWERS: Are you thinking not necessarily in the next three years or four years, but maybe longer term, and I'm not going to define what longer term is, but it's beyond 2003. I'll tell you that -- to have the equivalent of a SPAR for fire or other external events?

MR. COE: The current SPAR development plan speaks of external initiating event models, but doesn't, under the current budget forecasts, doesn't really begin to really get started with that until I believe it's fiscal '03 or '04.

DR. POWERS: Well, I mean, that's pretty soon. I mean, that's more encouraging than I would have thought.

MR. JOHNSON: Again, you're asking a question that really is better answered by Research, I think.

DR. POWERS: You guys are on the hook. You can't get out of it that easy.

CHAIRMAN BONACA: I have a question on a separate issue. It's more for information. I can't remember.

If you have risk informed PI, say, something that we discussed before safety injection, and it goes from your green to, say, white or yellow, do you perform a significance determination evaluation of that?

MR. JOHNSON: No, we don't.

CHAIRMAN BONACA: But if you did, that would blend the criticism we are making of not being plant specific because what you would do, you would then use PRA to evaluate the significance of that, and therefore you'd absorb the blend of criticism that we are leveling on the process.

MR. JOHNSON: I actually answered too quickly. What I should have said was -- I think we're rushing to correct my answer -- what I really should have said was that in general the PI program is set with thresholds, and crossing those thresholds alone is enough to enter the action matrix. So if you have a white, then you do what the action matrix would require.

But there are a number of cases where nothing would prohibit, for example, an inspector from running a performance issue that happens to be also reflected in the PI through the SDP to determine the significance, and we've had a number of instances like

that where we have -- in fact, we're working on one right now that is a PI reporting issue that would have if the licensee reported it in a certain way that PI would be red, but we know that when we run that issue through the SDP, it's actually a white issue, potentially a green issue, and it deals with this issue of false exposure for demand failure that Mark talked about.

So in fact, probably the more accurate answer to your question is that, yes, inspectors can run a performance issue, any performance issue, through the SDP to determine its significance.

MR. SIEBER: Well, if you get into a degraded performance indicator, that calls for additional inspection. The additional inspection can or may not result in findings. Findings are run through SDP. So you end up having a risk input to everything that start out as a performance issue.

CHAIRMAN BONACA: No, I'm focusing only on the PI. What it means is that if you said, okay, I have a PI and now it's gone from green to yellow, say, and I'm going to run it through the significance determination process, which essentially relies on a plant specific PRA. Then all of the criticism we have been leveling on the process will be eliminated

because you will have an opportunity to evaluate after the fact, okay, whether or not it's significant, and you would treat it like anything else that you treat by significance.

MR. JOHNSON: I would say that the safety system unavailability working group that we've empaneled acknowledges that and recognizes the problems that we have with fault exposure hours not being plant specific, being more generic in nature, the PI itself being generic in nature.

And we are working towards developing an unavailability PI that I think I indicated earlier we would want to pilot starting in January.

But in the interim, we've done, I think exactly what you've just described, and that is for those PIs, safety system unavailability PIs where there's a demand failure, we would run it through the SDP, and we would tie it more closely to actual risk, rather than just using a generic counting of the hours, so to speak.

CHAIRMAN BONACA: Absolutely. I mean, at the beginning you use the reference system as you have right now, and then you filter it through a process where a plant specific PRA is being used to make a judgment on the significance of that.

That would, in my judgment, you know, address all the concerns we have raised.

MR. JOHNSON: And that's a short-term fix, right. That's a short-term fix that we're going to implement on -- we're hoping to implement by the first of January. So we're pleased to hear that ACRS is pleased with the approach we're talking.

MR. SIEBER: Well, okay. I guess that --

DR. POWERS: He's really gotten smooth over the years.

MR. SIEBER: I guess that the ultimate action that the staff can take is through enforcement, and to get to the enforcement process, you have to have inspections and findings. And it's the PIs that generate potentially the inspection process.

So to me, you know, at least in that sense it's tied together on more or less of a risk basis.

CHAIRMAN BONACA: It's indirectly. I think what they're proposing here to do would make it very direct in that, you know, from the beginning you don't have a true risk based determination in the calling (phonetic) of a PI, but you have a significance determination process allows you to get there, and so that would -- and that would not really complicate the system.

MR. COE: No, that's right, and I'm not sure we would want to have a system where the changing of the color of a PI would then generate --

CHAIRMAN BONACA: I understand.

MR. COE: -- further regulatory aggravation by having an inspection. We would want the PI ultimately to do it all for us. That would be plant specific enough that it would do it all for us. It wouldn't require additional inspection because that would be more resource on us, as well as licensees.

CHAIRMAN BONACA: In that case then you would consider, for example, saying, okay, it looks as if this licensee is going from green to white. Let's evaluate through the SDP if it is true, and then you would have this assessment that would allow you to keep a green, for example, if, in fact, the significance of it was very low.

MR. COE: That's correct.

CHAIRMAN BONACA: Okay. So you were not stepping in, and you would have the basis for keeping it in the green, which would be based on plant specifics.

MR. COE: That's correct.

MR. SIEBER: I would be nervous if you

attempted to, even if they were plant specific, set PI thresholds that would skip over inspection process to arrive at some kind of enforcement action. That's different than what your chart that you gave us.

MR. JOHNSON: But let me -- well, I was almost going to try to see if I could say what it was you would be saying in terms of describing the enforcement program and see if maybe I can clarify it a little bit.

When we set it up, we have PIs and inspections that are independent inputs, and each of those are enough to get you across threshold into --

MR. SIEBER: SDP.

MR. JOHNSON: -- some assessment act -- beyond SDP, into some assessment action.

MR. SIEBER: Okay.

MR. JOHNSON: Including enforcement if there's a violation associated with a finding, but depending really on the action you make, you could get an order or, you know, some other enforcement, things that are typically considered enforcement actions.

And so as I think Mark was trying to describe, we don't have the situation or we don't want to set up the situation where you have a PI and then you've got to go out and do some inspection and then

run that through the SDP and now you have what you need to enter the action matrix.

The PIs and the inspections, each are independent input and sufficient inputs into the action matrix. What we're trying to deal with is this problem that we have with unavailability PIs and the fact that they're not, as we set them up now, risk informed.

So in those specific cases where we have these large blocks of exposure, that it would be better to run those through the SDP because that risk informs those. That takes the leap in the short term to get us where we're trying to go.

CHAIRMAN BONACA: So rather than having the pain of adjusting them all up front, which would be a very big challenge, you really have a process by which in the few cases where you have a step-down performance potentially, you do evaluate through this significance determination process --

MR. COE: That's true.

CHAIRMAN BONACA: -- and make the call.

MR. COE: Yes.

DR. ROSEN: In your earlier spirited defense of the adequacy of the safeguards and emergency preparedness indicators, you said something

like we're pleased that we've seen licensees take actions based on these indicators to improve performance in those areas, in a sense basically rating the indicator by whether there was a response by the licensee to it.

MR. COE: Backing into the answer, so to speak.

DR. ROSEN: Yeah, backing into the answer, and that's sort of been troubling me and gnawing at me. I'm not quite sure what the issue is, what's bothering me, but I think it goes back to the question the Commission asked us, which is are these indicators providing meaningful insights into aspects of plant operation that are important to safety.

And we have to write to the Commission something about that, and your answer is, well, we don't know about that. The licensees sure are doing something.

I can't quite connect those things.

MR. JOHNSON: Can I try to -- I think that was my statement actually.

MR. COE: No, I think it was Don's, but go ahead. You can defend it.

MR. JOHNSON: Don is the person who amplified it. I probably said it in the wrong way.

What I meant to say was that with respect to, for example, the emergency preparedness performance indicators, we have found instances since the ROP based on these performance indicators where, for example licensees were, perhaps performing well with respect to drills, but only a small percentage of the responders were participating in the drills.

And based on these performance indicators, they provided broader training to all of the likely responders, and in addition, measured the performance of those responders through this drill participation, this drill performance indicator and the combination of those two have resulted in improved performance in areas that we think are important with respect to the emergency preparedness area.

So what I said, I think, was maybe that the licensees are improved -- if they want to improve their performance, they run more drills, and so, in fact, they've done that, but the point I was trying to make was in areas where we think performance needed to be improved based on what we believe is important with respect to the cornerstone, we've seen licensee performance. We've seen these performance indicators indicate performance problems, and we've seen licensees take action to address those performance

problems in areas that are important.

Hopefully that better clarifies what I meant to say.

DR. ROSEN: It does, and I think what I have to do is make the hard link between if the licensee performs better in the safeguards area, then that is an aspect of plant operation that's important to safety, ergo, we are safer.

I mean, that's not something this program can do for me. I have to have that external from your finding. You tell me the licensee is performing better in the safeguards area or in the emergency preparedness area, and therefore, the plant is safer.

It's not as direct a measure as in the mitigating systems area. It takes another piece of information outside of the finding that comes out of this program, if I'm expressing myself correctly.

MR. JOHNSON: I understand.

DR. ROSEN: You have to have this article of faith first, and then you can draw that conclusion.

MR. JOHNSON: It's certainly not as easy in the non-reactor safety cornerstones, particularly the EP -- no, particularly the physical protection cornerstone. It's not as easy to make that tie, if you will.

MR. COE: But the common framework has been that each cornerstone has been described as having several key attributes, and the words "key attributes" are not -- there's a definite set of attributes as we've spelled out in SECY 007, and each of the cornerstones has those attributes spelled out, and each of those attributes is assessed in some fashion, either through the performance indicator program or through inspection findings or maintenance rule inspections, PI&R inspections, et cetera.

And so across all cornerstones, there's that same common basis. So your hard link is really the adequacy with which you feel the staff has identified the key attributes of each cornerstone and has appropriately linked those key attributes to some method of measurement, either PIs or inspection.

DR. KRESS: I think his problem is how to quantify those key attributes in terms of their impact on actual risk for safety.

MR. COE: I understand that's the problem.

DR. KRESS: Ones in one cornerstone may have much smaller impact than ones in an attribute in another cornerstone.

DR. ROSEN: How do you weight the cornerstones?

DR. KRESS: And how do you weight the two, I think, is his issue, his problem.

MR. COE: Okay. If we're ready to move beyond SDP at this point we can go to inspections and the challenges that we faced in the inspection. The conduct and documentation of inspections has been one of defining in a consistent manner what our threshold is for documentation.

The standards are articulated in our guidance document 0610, and we're continuing to work on improving that in terms of how we document them and at what threshold we document inspection findings.

We have the maintenance rule inspection procedure, which during the first year of implementation was felt to be -- we felt we could improve its risk and performance focus, and so we've engaged in pilot inspections, and we are rewriting the inspection procedure and engaging in the pilot inspections to test it out.

We expect that those will be ready for -- the new inspection procedure will be ready for issuance in the next inspection cycle starting on January.

DR. WALLIS: I'm sorry. I didn't understand the first bullet at all. You don't mean

thresholds in the documentation. You mean documentation of thresholds or documentation of determinations of something?

I don't understand what you mean by documentation.

MR. COE: The issue here is at what threshold does the inspector document a finding. In some part this is based on whether the finding is deemed to be minor, in which case if it's deemed to be minor against a set of criteria that we've tried to provide, then the inspector does not document it at all.

DR. WALLIS: So this word "threshold" here has nothing to do with all the other thresholds we've been talking about.

MR. COE: That's correct. It's a documentation threshold. That is, at what threshold does the inspector actually document their findings and observations?

And because the definition of minor isn't as precise as some of our other definitions, there's been some variability there. We're trying to improve that.

DR. WALLIS: So these thresholds, I mean, you could say they're consistent. If it's white, you

have to document it, and you could relate it to the other thresholds.

MR. COE: Yes. Well, there's no question about findings that are green or white or yellow or red. We document those. Okay?

The question comes in many cases as to, you know, whether your finding -- if your finding is minor, then you don't document it at all.

DR. WALLIS: This is sort of the no color threshold.

MR. COE: Well, and then there's the question of no color findings, which we've addressed as we've indicated earlier. That was originally an issue as well.

The no color findings were documented. There wasn't any question about that, but how they were documented, to what extent they were documented. In other words, one of our objectives is to try to reduce the bulk of the inspection report and to more properly focus it on issues of greater significance.

So you'll see our inspection reports are smaller in volume, and we try to be more focused and we try to cut out a lot of the filler or not filler necessarily, but the information that might have historically been included in order to get to the more

significant issues.

The next point is licensee self-assessments. We're considering that. We're starting to think about that. I think we have to really think carefully. We've only had a year's worth of experience, but we certainly are beginning to think about how to apply licensee self-assessment programs within the ROP framework.

And finally PI&R inspection frequency went to biennial from an annual. However, the number of inspection hours annualized only dropped by about 25 percent because we added a few more hours in between the biennial team inspections, which were about 250 hours now. We've allowed for about 60 hours of inspection on specific issues.

And this was to try to reduce somewhat the burden on the licensee by giving them a team inspection once every two years rather than once every year and also to allow the staff to probe, the inspection staff to probe into areas that were specific to PI&R concerns in between the two -- in between the team inspections.

So that's a summary of some of the major insights that we've gained in our first year, and at this point I guess we'll be happy to answer any

follow-up questions.

DR. POWERS: I have a question. I'm intrigued to know what your response is to those plants that were, I think, SALP-1 plants in the past, got relatively little inspection, and suddenly find themselves being inspected quite a little bit more under this new system and yelp about that.

What is the stock response to them?

MR. JOHNSON: I'll start, I guess. I don't know that we have sort of a response that we've had a lot of success with, to be honest. I mean --

DR. POWERS: I didn't say it was successful.

MR. JOHNSON: And to be honest, there haven't been a lot of licensees who have raised that particular concern, although the industry in general would say -- has, in fact, looked at where we came out with respect to resources in general and does expect that we continue to look for efficiencies when we go forward.

And there are, it's true, there are plants that were SALP-1 and, in fact, so they are getting more inspection under the baseline.

One of the things that was interesting with respect to the response to the Federal Register

notice from licensees, and we had generally NEI writing in, but we had some individual licensees writing in, and it dealt with -- it deals with the perception of burden.

And while there are licensees who, I think, in fact, get more inspections, there are a whole bunch more licensees who think that the burden is more appropriate in that they're not having to react to the impact of inspections, that is, findings, a lot of findings at a very low level that tend to distract and cause licensees to expend their effort.

So I think when I talk about it, I talk about not inspection knowledge, but I talk about the burden of the program, and I think there's a wide acceptance to this fact that the burden with respect to the ROP is more right size given the significance of the issues and what we've been able to do through the SDP and other things.

That's sort of what I try to do to answer that question

MR. COE: And I would only add that the good performers get good outcomes in terms of our assessment process still. Okay? And the extent of inspection that they get, although it's more normalized across all of the plants is one of the

burdens that we all share in achieving this public confidence, one of our strategic goals.

DR. POWERS: Well, it seems to me that one of the challenges that you face in getting public confidence in the system is that when they look at this system versus the old system with respect to just inspection -- and I really liked your answer, by the way, on look at the total thing and the burden -- but when they look at just inspection, they say, "Yes, the NRC has created a system. They inspect the good performers more. That means they're inspecting the bad performers less."

MR. SIEBER: That's right.

DR. POWERS: And I think that's a challenge, and I really liked your answer from the total burden is that you're putting the weight really where it does the most good as opposed to just being out there inspecting. I like that answer.

MR. SIEBER: Well, I'm not exactly sure that I agree with that whole statement because no matter whether you get a violation under the old system where you had to write an answer back, it still ended up in your corrective action program, and even non-sited violations end up in the same place and green findings end up in the same place. Everything

ends up in your corrective action system

And so the burden that the licensee has regarding how he has to deal with all of these issues is totally dependent on the deficiencies that are in the plant, whether you find them or the licensee finds them.

What does change is the licensee's inspection fee, as a good licensee's hours went up, so he pays more money, and a lesser performing licensee ends up getting a fee reduction, which to me is something the chief financial officer sees.

DR. POWERS: It would be interesting to see the stats on that. I agree with you that the good performers get a fee up.

MR. SIEBER: Right, and more inspection hours.

DR. POWERS: But I'm willing to bet if this system is working right that the bad performers didn't see any reduction in fee.

MR. SIEBER: Well, inspections.

DR. POWERS: And fees for inspections.

MR. SIEBER: Inspection hours.

DR. POWERS: But in total, what they're saying is it's not fair to look just at inspection hours.

MR. SIEBER: But that's what you get billed on, and as long as you aren't getting civil penalties, that's the monetary --

MR. SATORIUS: But if I could add, I think one of Mike's points also was the fact that to go beyond just fee billing because arguably the old SALP-1, the current program is a good performer, and the SALP-3, the current, isn't an acceptable performer. They're going to have more expenses with entering things into their corrective action. They're going to have more issues.

MR. SIEBER: That's right.

MR. SATORIUS: They're going to have more staff hours that they're going to spend to resolve these issues arguably than the good performer who has a more robust corrective action system and has better maintenance, has less issues to resolve.

MR. SIEBER: And that was my first statement, is you're going to pay for those whether you find them or the licensee finds them.

MR. JOHNSON: Yeah. I guess the other point I would make is don't forget that the reason sort of the outcry a couple of years ago, two and a half years ago, whenever it was, that got us on this path revising the oversight process was -- and it

didn't relate to inspection hours or fees. It related to predictability. It related to burden. It related to objectivity or really subjectivity being central to the process.

And those are the things where I think this current process offers relief that licensees -- that make them think that this is a better process.

Now, we've got challenges. The point about -- you know, David Lochbaum still says that we don't spend enough attention on plants with significant performance problems. That's his criticism of the ROP.

You know, he's looking at it from the other perspective. When you get an IP-2 or you get a plant that's having -- that ends up in the degraded cornerstone column of the action matrix, he wants us to do more than we're doing today.

So the people who fall on the other side of the spectrum, that's the other piece of the story, I guess.

MR. SIEBER: Well, the objectives that were laid out by the commission, which appears in the first couple of pages of your assessment document which just came out, I'm pretty well convinced that you are on the way to hitting all of them. But I

picture this process as going on for another five years at a minimum where you can say, "Yeah, I have all of these bases covered," and so you're just on the doorstep of the edit (phonetic), in my view.

Would you disagree with that?

MR. JOHNSON: Not at all, not at all.

CHAIRMAN BONACA: Actually, I mean, I think there's more even distribution of resources is a better approach. I mean, there used to be before the fact that they were presumed good performers that continue to be presumed good performers because they didn't look enough. When they looked hard, they find they were not anymore.

So you know, that is a problem, and I think today with a more even distribution of resources, that's not going to happen as easily.

MR. SIEBER: Any other questions or comments?

MR. JOHNSON: Just one last comment, if I can. I really was serious when I suggested that we benefit from these exchanges, and we do need the help of the ACRS to the extent the ACRS is willing to weigh in with respect to the SSU development work that we're going to do, to look at the piloting in January and going forward.

So if there is an opportunity and if the ACRS is willing, we'd look forward to opportunities to continue to interface and get your input.

MR. SIEBER: I think that's appropriate.

If there are no other questions, Mr. Chairman, I'll turn the meeting to you.

CHAIRMAN BONACA: Thank you. Thank you very much.

At this point I think we will, first of all, go off the record. We don't need a transcriber anymore.

(Whereupon, at 4:22 p.m., the meeting was adjourned.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on Reactor Safeguards

Docket Number: (Not Applicable)

Location: Rockville, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Rebecca Davis

Rebecca Davis
Official Reporter
Neal R. Gross & Co., Inc.

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
485TH MEETING
EPRI REPORT - RESOLUTION OF GL 96-06 WATERHAMMER ISSUES
SEPTEMBER 5, 2001
ROCKVILLE, MARYLAND

PRESENTATION SCHEDULE

	TOPIC	SPEAKER	TIME
1.	Subcommittee Report	T. Kress/G. Wallis	10:20 a.m.
2.	NRC Staff Comments on EPRI Waterhammer Report	J. Tatum, NRR	10:30 a.m.
3.	EPRI Presentation (**Open/Closed**)		10:50 a.m.
	• Introduction	V. Wagoner, CP&L	
	• Response to Comments Noted During 1/16-17/01 Subcommittee Meeting	T. Esselman, Altran	
	- Determination of air release fraction - Determination of "hA" term - Scale-up of test data		
	• Risk-Impact of Issue		
4.	NRC Staff Comments on Resolution of GL 96-06 Issues (**Open**)	J. Tatum, NRR	12:00 p.m.
5.	Committee Discussion and Recess		12:20 p.m.

Reactor Oversight Process

Inspection Program Branch
September 5, 2001

TOPICS FOR DISCUSSION

- *Background*
- *ROP Update*

Background

- *Continuing series of briefings on ROP*
  - *12/00 - ROP status*
  - *5/01 - SDP & PIs*
  - *7/01 - Action Matrix*

- *ROP Status*
  - *Completed first year*
  - *Completed first AARM*
  - *Completed SECY*

ROP Update

- *Performance Indicators*
- *Assessment*
- *SDP*
- *Inspection*

RESULTS AND ACTIONS

Performance Indicators

- ***Replacement Scram PI***
- ***Unplanned Power Change PI***
- ***Improving SSU***
  - ***Fault Exposure Hours***
  - ***Inconsistencies Between Programs***

RESULTS AND ACTIONS

Assessment

- ***Consistent Response to PI and Inspection Issues***

- ***No-Color Findings***

RESULTS AND ACTIONS

SDP

- ***Documenting Assumptions***
- ***Timeliness***
- ***Continuing SDP Development***
  -Benchmarking Phase 2 Notebooks
  -Shutdown, Containment, Fire
  -S/G Tube Degradation, Spent Fuel

RESULTS AND ACTIONS

Inspection

- ***Documentation Thresholds***
- ***Maintenance Rule Inspection Procedure***
- ***Licensee Self-Assessments***
- ***PI&R Inspection Frequency***

OPEN

GL 96-06/EPRI INITIATIVE

NRR STAFF REVIEW -- COMMENTS & PERSPECTIVE

- ISSUES RAISED BY THE ACRS T/H SUBCOMMITTEE ARE VALID
  - + LIMITATIONS OF AIR RELEASE FRACTION TEST APPARATUS
  - + DETERMINATION OF "h"/"hA" FOR CONDENSING HEAT TRANSFER
  - + SENSITIVITY OF "SCALING-UP" TEST DATA TO PLANT DESIGN

GL 96-06/EPRI INITIATIVE

NRR STAFF REVIEW -- COMMENTS & PERSPECTIVE

- OTHER FACTORS TO CONSIDER
  - + COMPLEX PHENOMENON; DIFFICULT TO MODEL
  - + EPRI EVALUATION & ENDORSEMENT BY EXPERT PANEL
  - + NUREG/CR-5220 W/H LOADS REDUCED BY A FACTOR OF 1.2 - 1.6
  - + LOOP EVENTS ARE BOUNDING; USI A-1 RESOLUTION (NUREG-0927, REV. 1)
  - + COOLING WATER SYSTEMS ARE MAINTAINED (GL 89-13)
  - + LOW SAFETY SIGNIFICANCE; MARGINAL BENEFIT FOR ADDITIONAL EFFORT

GL 96-06/EPRI INITIATIVE

PRELIMINARY CONCLUSIONS

- EPRI METHODOLOGY SEEMS TO BE REASONABLE AND ADEQUATE FOR THE INTENDED APPLICATION

- SE TO IMPOSE RESTRICTIONS AS NECESSARY TO ASSURE PROPER APPLICATION
  - + LIMITED TO EVALUATION OF GL 96-06 WATERHAMMER ISSUE
  - + OTHERS MAY BE IDENTIFIED AS STAFF REVIEW IS COMPLETED

GSI-191:
Proposed RES Recommendation for Resolution

Presenters
Michael Marshall, 301-415-5895
Art Buslik, 301-415-6184

ACRS Presentation
Rockville, MD
September 5, 2001

Overview of GSI-191

- Determine whether debris accumulation on sump screens will cause loss of net positive suction head (NPSH) margin following a loss-of-coolant accident (LOCA).

- Determine if further action needs to be taken for pressurized water reactors beyond what was done during the resolution of Unresolved Safety Issue A-43.

Overview of Generic Issue Process

- Why is GSI-191 being transitioned to new process?

Stages in Old Process		Stages in New Process
▸ Identification		▸ Identification
▸ Prioritization		▸ Initial Screening
▸ Resolution	⟷	▸ Technical Assessment
▸ Imposition		▸ Regulation and Guidance Development
▸ implementation		▸ Regulation and Guidance Issuance
▸ Verification		▸ Implementation
		▸ Verification

☛ ACRS issued a letter regarding new process on May 18, 2001.

Overview of Generic Issue Process

- Key Differences

- "Resolution" is not an interim step in new process
  - Closed or Excluded From Further Consideration

- Generic issue designation is kept until issue is excluded from further consideration (i.e., closed) in new process

Status of GSI-191

- GSI-191 has been transitioned from the old generic issue process to the generic issue process described in Management Directive 6.4

- GSI-191 is near the end of the Technical Assessment Stage of the Generic Issue Process

- RES will transmit its recommendation to the Director, NRR, by the end of September 2001.
  - NRR will have lead for GSI-191.

Proposed RES Recommendation for Resolution

- Plant-specific analyses be conducted to determine whether debris accumulation in containment will impede or prevent ECCS operation during recirculation.
  - Loss of NPSH Margin
  - Long-Term Cooling
- If it is determined that debris accumulation will impede or prevent ECCS operation, then appropriate corrective actions should be implemented.

Technical Bases for Proposed Recommendation

- Parametric Evaluation
  - Credible technical basis for making a determination that sump blockage is a generic concern for PWRs.

- **Risk and Cost-Benefit Considerations**
  - Substantial safety benefit from making fix .
  - Increasing the sump screen surface area is cost beneficial.

☛ On July 26 and 27, 2001, the NRC staff presented the parametric evaluation results, core damage frequency contribution estimates, and benefit estimates at a public meeting.

Overview of Parametric Evaluation

- Analyses addresses debris generation, debris transport, debris accumulation, and the resulting head loss across the sump screen.
- Analyses addresses variability in relevant plant features such as screen area, sump configuration, debris sources, etc.
- Some relevant plant features could not be addressed such as debris location, containment configuration, etc.
- Provide a reasonable representation of operating PWRs, so the results form a credible technical basis for making a determination of whether sump blockage is a generic concern for PWRs.

☛ ACRS briefed on parametric evaluation on July 12, 2001.

Overview of Parametric Evaluation

- Very little fibrous and particulate debris is needed to cause loss of NPSH margin
  - Small NPSH margin
  - Small Sump Screen Area
- Most of parametric cases analyzed for Large LOCA resulted in loss of NPSH margin
- Some of the parametric cases analyzed for Small LOCA resulted in loss of NPSH margin

RISK AND COST-BENEFIT CONSIDERATIONS ASSOCIATED WITH GSI-191,

"ASSESSMENT OF DEBRIS ACCUMULATION ON PWR SUMP PERFORMANCE"

ARTHUR BUSLIK

USNRC/RES/DRAA/PRAB

(301)415-6184

PRESENTED TO ACRS ON SEPTEMBER 5, 2001

SCOPE OF WORK

-- CALCULATE THE DECREASE IN CORE DAMAGE FREQUENCY FROM FIXING THE SUMP-SCREEN CLOGGING PROBLEM

-- AS PER REG. ANALYSIS GUIDELINES (NUREG/BR-0058,rev. 3), CALCULATE THE MONETIZED BENEFITS FROM FIXING THE SUMP-SCREEN CLOGGING

-- ESTIMATE COSTS ASSOCIATED WITH FIXING THE PROBLEM

-- COMPARE COSTS WITH BENEFITS

-- LIMITED UNCERTAINTY ANALYSIS

OUTLINE OF APPROACH FOR CORE DAMAGE FREQUENCY CONTRIBUTION

The core damage sequence associated with sump screen clogging is:

LOCA(n)*RECIRC*SUMP-CLOGS*NON-RECOVERY

Here the n indexes the various size LOCAs.

LOCA(1)= Large LOCA=A

LOCA(2)=Medium LOCA=S1

LOCA(3)=Small LOCA=S2

LOCA(4)=RCP Seal LOCA

RECIRC= Event that ECCS recirculation is required

SUMP-CLOGS= Event that the sump screen clogs to the point that ECCS recirculation fails

NON-RECOVERY= Event that recovery actions fail

INITIATING EVENT FREQUENCIES

-- OBTAINED FROM NUREG/CR-5750 ("Rates of Initiating Events at U.S. Nuclear Power Plants: 1987-1995", February 1999)

INITIATING EVENT FREQUENCIES

	Mean	(5%, 95%) bounds
Large LOCA (> 6 inches)	7E-6/yr	(3E-7/yr, 3E-5/yr)
Medium LOCA (2 to 6 inches)	4E-5/yr	(1E-6, 1E-4/yr)
Small LOCA (0.5 to 2 inches)	5E-4/yr	(1E-4/yr, 1E-3/yr)
Very Small LOCA	6.2E-3/yr	
Stuck-Open Safety Relief Valve	5E-3/yr	
Reactor Coolant Pump Seal LOCA	2.5E-3/yr	

(Large LOCA frequency updated to take into account V.C. Summer event)

Seismic contribution calculated for Surry, and was small, when the revised LLNL hazard curves were used. Was neglected.

EVALUATION OF "RECIRC" AND "NON-RECOVERY"

-- Three different types of plants considered for SLOCA:

  -- Plants with large dry containments, emergency fan coolers, and large refueling water storage tanks (RWSTs)

  -- Plants with sub-atmospheric containments

  -- Plants with ice-condenser containments

EVALUATION OF "RECIRC" AND "NON-RECOVERY"

-- For medium LOCAs and large LOCAs, it was judged that it was certain to need to go to sump recirculation, and no credit was given for recovery; containment sprays will be actuated, and RWST will be depleted.

-- For very small break LOCAs it was judged that the chance of needing to go to recirculation was negligible; these LOCAs can be mitigated with charging pumps alone.

-- For stuck-open pressurizer safety valves, the probability of sump clogging was considered to be so small that the sequences could be neglected; the discharge into containment is from the quench tank rupture valve, and little debris would be generated.

-- Distinction between plant types enters only for SLOCAs and RCP seal LOCAs

PROBABILITY OF SUMP CLOGGING

The LANL draft technical letter report, "GSI-191: Parametric Evaluations for Pressurized Water Recirculation Sump Performance", July 2001, rev. 0, [the LANL parametric report] gives the likelihood of the potential for sump blockage, for each "case" ID.

These likelihoods were translated into probabilities as follows:

"very likely" P=1

"likely" P=0.6

"possible" P=0.3

"unlikely" P=0

THREE AGGREGATES OF PLANTS CONSIDERED

23 plant case: P(sump-clogs)=1, all size LOCAs

- -- 18 large drys
- -- 5 sub-atmospherics

32 plant case: P(sump-clogs)=1, for LLOCA and MLOCA

- -- 24 large drys
- -- 5 sub-atmospherics
- -- 3 ice condensers

40 plant case: P(sump-clogs)=1, for LLOCA, either 1 or .6 for MLOCA

- -- 32 large drys
- -- 5 sub atmospherics
- -- 3 ice condensers

AVERTED CORE DAMAGE FREQUENCY ESTIMATES FOR THE THREE AGGREGATES

23 PLANT AGGREGATE: Psump=(1,1,1) for LLOCA, MLOCA, SLOCA

Δ(CDF)= 9E-5/YR

32 PLANT AGGREGATE: Psump=(1,1, ANYTHING)

Δ(CDF)= 1E-4/YR

40 PLANT AGGREGATE: Psump= (1, 1 or 0.6, ANYTHING)

Δ(CDF)= 9E-5/YR

SUBSTANTIAL SAFETY BENEFIT FROM MAKING THE FIX

MONETIZED BENEFITS FROM AVERTING ACCIDENTS ASSOCIATED WITH SUMP CLOGGING

Generally, NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook", was followed.

BENEFITS CONSIST OF:

- **EXPECTED AVERTED POPULATION DOSE TO 50 MILES, MONETIZED AT $2000 PER PERSON-REM (~17% of benefit)**

- **EXPECTED AVERTED OFFSITE FINANCIAL COSTS**

- **EXPECTED AVERTED ONSITE COSTS (CLEANUP AND DECONTAMINATION; REPLACEMENT POWER)**
  (These dominate-- about 80% of benefit)

- **EXPECTED AVERTED ONSITE OCCUPATIONAL DOSE, MONETIZED AT $2000 PER PERSON-REM**

Benefits, continued

-- Results, for various combinations of the probabilities of sump clogging for the types of plants considered were generated. (For example, results were generated for a sub-atmospheric containment plant with a probability of unity for sump screen clogging for all size LOCAs.)

-- Then results for 3 aggregates of plants were generated. These aggregates corresponded to sets of plants which had various probabilities of sump clogging according to the LANL parametric report.

COST ANALYSIS FOR GSI-191

- Data Sources Used
  - BWR STRAINER BLOCKAGE EXPERIENCE
  - SUMP DEBRIS FIXES PERFORMED BY PG&E
  - CONTRACTOR/VENDOR ESTIMATES
- Cost Elements
  - Up-front analytical activities
    - Revise Reg. Guide and Issue Generic Communication
    - Develop Uniform Guidelines
    - Perform Reactor Specific Analysis
  - Physical modification (increase sump screen areas)
  - Other cost elements (audits/inspections)

COST-BENEFIT COMPARISON

The cost of fixing N plants is:

($6.12E5)*N+ $9.221E6 (year 2001 dollars; year 2001 present value)

For the purposes of the cost-benefit analysis it was assumed that 50% of the plants would seek license renewal, and that the benefits could here be adequately approximated by taking the average of the benefits for plants with t=14 years and t=34 years, where t = no. of years of operating life remaining with the fix in place. Fourteen years is the average remaining lifetime for a PWR with the fix in place (in about 3 years from now). With a 20 year license renewal period, the average lifetime would be 34 years.

COST-BENEFIT COMPARISON, CONTINUED

Case	Benefit	Cost	Benefit-Cost
23 plant case	$50E6	$23E6	$27E6
32 plant case	$85E6	$29E6	$56E6
40 plant case	$92E6	$34E6	$58E6

Year 2001 dollars; 2001 present value

CONCLUDE THAT IT IS COST EFFECTIVE TO REQUEST PLANT-SPECIFIC ANALYSES ON THE PART OF THE LICENSEES

UNCERTAINTIES

1. **LOCA frequencies**

Large LOCA

Assuming lognormal distribution with error factor of 10, as in NUREG/CR-5750:

95th percentile:	**3E-5/yr**
Mean:	**7E-6/yr**
Median:	**3E-6/yr**

Medium LOCA

95th percentile:	**1.5E-4/yr**
Mean:	**4E-5/yr**
Median	**1.5E-5/yr**

UNCERTAINTIES, CONTINUED

Small LOCA

95th percentile:	1E-3/yr
Mean:	5E-4/yr
Median:	4E-4/yr

2. **Probability of Sump Screen Clogging**

   -- **Assessment of likelihood of loss of sump recirculation took into account the fact that the operator may shut off one pump if there is loss of net positive suction head (NPSH), but it is unclear whether the likelihood assigned to this action was realistic.**

   -- **LANL used licensing criteria for loss of NPSH; unclear what effect this has.**

UNCERTAINTIES, CONTINUED

3. **Human error probabilities for recovery actions given sump recirculation failed were based on two IPEs, without additional analysis.**

4. **The assumption was made that the likelihood of having to go to sump recirculation for a small LOCA, for a plant with a large dry containment, was the same as for a Westinghouse plant like Callaway or Comanche Peak, which have emergency fan coolers and large RWSTs. May be optimistic for some plants with large dry containments.**

5. **Offsite consequences, given core damage**

   Very likely overestimated chance of early containment failure, but offsite health effects do not dominate the benefits. Also, chance of early containment failure only 2%.

NET EFFECT OF UNCERTAINTIES ON AVERTED CDF

-- Did uncertainty analysis for large dry containment case

-- Most plants have large dry containments

-- Used Saphire code, performing uncertainty analysis on the expression used for the averted CDF, namely

$\sum$ LOCA(N)*RECIRC*SUMP*NON-RECOV

-- OBTAINED:

95th percentile upper bound=	1.8E-4/yr
Mean=	6.7E-5/yr
Median=	4.0E-5/yr
5th percentile lower bound=	1.2E-5/yr
standard deviation=	8.6E-5/yr

UNCERTAINTIES FOR LARGE DRY CONTAINMENT PLANT

-- This is the uncertainty in averted CDF for <u>one</u> large dry plant. The percentage uncertainty in the sum over a set of plants is less. For example, if the 18 large dry plants had their averted CDFs drawn randomly and independently from the same distribution, and if the sum of the 18 CDFs were nearly normally distributed (central limit theorem) then the median would be equal to the mean (which is the sum of the means), and the 5% lower limit on the average CDF would be

$$6.7\times10^{-5}-2\sigma/\sqrt{18}$$

or about 2.7E-5/yr. This implies that even with consideration of uncertainties it is cost-effective to request plant specific analyses.

-- Uncertainties are likely larger for subatmospherics and ice condensers

Technical Bases for Proposed Recommendation

- Parametric Evaluation
  - Credible technical basis for making a determination that sump blockage is a generic concern for PWRs.

- **Risk and Cost-Benefit Considerations**
  - Substantial safety benefit
  - Increasing the sump screen surface area is cost beneficial.

Proposed RES Recommendation for Resolution

- Plant-specific analyses be conducted to determine whether debris accumulation in containment will impede or prevent ECCS operation during recirculation.
  - Loss of NPSH Margin
  - Long-Term Cooling
- If it is determined that debris accumulation will impede or prevent ECCS operation, then appropriate corrective actions should be implemented.

Rockville, MD
September 5, 2001

Open

EPRI/Industry Collaborative Project to Support Resolution of GL 96-06 Waterhammer Issues

Vaughn Wagoner, CP&L, Chairman, Utility Advisory Group
Dr. Peter Griffith, MIT, Chairman, Expert Panel
Dr. Tom Esselman, President, Altran Corporation

NRC/ACRS Meeting
Washington D.C., September 5, 2001

1

Objective

- Provide overall description of work performed to assist in the resolution of GL 96-06.
- Provide specific information requested by the Thermal Hydraulic Subcommittee

2

Program Objectives

- Understand the behavior of the system during the transient.
- Determine safety significance of issue
- Provide methodology to assure pressure boundary integrity.
- Minimize unnecessary modifications to plant systems.

3

Team

- A consultant and an Expert Panel was used to implement the program
- Expert Panel utilized to review program and results
  - Dr. Peter Griffith, MIT, Chairman, Expert Panel
  - Dr. Fred Moody, Consultant, Expert Panel
  - Dr. Ben Wylie, University of Michigan, Expert Panel
- Utility Steering Committee was active

4

Pipe Capacity to Withstand Internal Pressure

Material	S_{allow} (ksi)	S_{ult} (ksi)	OD x Thickness (in.)	P_{burst} = ($S_{ult.}$* r/t) (psi)	Waterhammer Pressure at 20 ft/sec (psi)
A106 Gr. B (typical piping)	15	60	12.75x 0.375	3,750	600
B280 (typical HX tubing)	6	30	5/8 x 0.035	3,780	600

5

Risk Considerations

- The probability of the postulated initiating event (LOOP and LOCA or MSLB) is less than 10^{-6} per year.
- Risk of Pipe Failure
  - Significant margin exists in the capacity of pipes to resist burst due to internal pressure
  - Support failure and subsequent deformation would be required to challenge the pressure boundary integrity.
- Piping systems have withstood many LOOP-only (non-cushioned) events during testing and no safety functions have been impaired.
- Focus becomes compliance for piping support systems
  - Apply reasonable adjustment to theoretical loads
  - Adding unnecessary supports can reduce overall plant safety

6

GL 96-06/EPRI INITIATIVE

INTRODUCTION -- BACKGROUND INFORMATION

- GL 96-06 WATERHAMMER & NUREG/CR-5220
  - + COMPLIANCE ISSUE
  - + EVENT SCENARIO

- EPRI INITIATIVE PROPOSED 8/98

- ABOUT 24 PLANTS/12 UTILITIES PARTICIPATING

- EPRI METHODOLOGY PRESENTED TO ACRS T/H SUBCOMMITTEE (11/99; 1/01; 8/01)