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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

MEETING OF THE SUBCOMMITTEE ON THERMAL-HYDRAULIC PHENOMENA

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WEDNESDAY,

FEBRUARY 11, 2004

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 1:00 p.m., Dr. Graham Wallis, Chairman, presiding.

COMMITTEE MEMBERS:

GRAHAM B. WALLIS, Chairman

SANJOY BENJEREE, ACRS Consultant

RALPH CARUSO, ACRS Staff

THOMAS S. KRESS, Member

VICTOR R. RANSOM, Member

JOHN D. SIEBER, Member

ACRS STAFF PRESENT:

RALPH ARCHITAL

STEVE BAJOREK

STEVE BLOOM

JOSEPH COLACCINO

J. GENE HSII

WALTON JENSEN

JIM LYONS

YURI ORECHWA

JOHN SEGALA

ED THROM

JENNISFER UHLE

LEN WARD

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

(1:05 p.m.)

CHAIRMAN WALLIS: Okay. We are back on the record, and this session will be open. We will begin with Dr. Susan Sterrett.

MS. STERRETT: Okay. Thank you for letting me talk today about something I think is important.

CHAIRMAN WALLIS: Are you on with the mike and all that?

MS. STERRETT: Sorry?

CHAIRMAN WALLIS: You have to speak into that mike.

MS. STERRETT: Can you hear me now?

CHAIRMAN WALLIS: Yes.

MS. STERRETT: Okay. Hello. I'm Susan G. Sterrett. I'm a professor of philosophy at Duke University in Durham, North Carolina. Prior to my academic career, I worked on the design of nuclear power plants. My comments today are just updates to remarks made to ACRS committees on previous occasions.

First a brief review. In earlier remarks, I expressed concern. There were really two issues, one over whether the AP1000 integrated plant design had been designed to the level of detail appropriate

for the 10 CFR Part 52 process under which it's been submitted for design certification.

As I understand it, the analyses performed were supposed to reflect inasmuch as possible, final design based upon verified design calculations. After final design approval, the questions that can be asked are very limited. So, the new 10 CFR 52 one-step licensing process is meant for a plant design that's at about the stage in the design process where plants under the older two-step process were at when applying for an operating license.

So, one of the things I ask is whether the AP1000 design was at that stage or at a more preliminary stage, that is, a stage where perhaps the major components and lines of primary safety systems had been sized and functional capabilities of other systems specified but where not all the details guaranteeing those functional capabilities were in fact provided have been yet specified or verified.

Then in other remarks, I asked about the process by which the AP600 integrated plant design was operated to an integrated AP1000 plant design. There are a number of questions that I think ought to be asked to insure confidence in this design. One major question was who's entitle to make the decision about

which features, calculations, and documents for the AP600 need to be reviewed for changes in upgrading to the AP1000? A change control process meant to evaluate how individual proposed design changes to an already sort of determined plant design are evaluated and implemented probably will not address the kind of overarching questions that arise in such a major uprating.

Okay, so far that's just what I asked before. There's been --

MR. KRESS: Let me ask you a question.

MS. STERRETT: Sure.

MR. KRESS: Why do you view this as an upgrade? Why not just view it as a different design?

MS. STERRETT: Well, yes, it's only because Westinghouse called it an uprating, but I think the reason that they did that, you can ask them, but I believe last time when Ron Butte gave a presentation to the ACRS committees, that's what he said.

MR. KRESS: It doesn't fit the description of an uprate that the staff normally uses.

MS. STERRETT: Yes. You know, yes, I'm just trying to understand how to conceptualize it. I think the reason is that they approach it as a design

constraint is not to change anything unless you have to, and that's very much like an uprating. So, that means you inherit as much as possible whereas if you were doing a new plant design, you wouldn't probably have that kind of constraint. Does somebody want to comment on that?

CHAIRMAN WALLIS: I think what we're doing is we're actually treating it as a new design.

MS. STERRETT: Okay.

CHAIRMAN WALLIS: But we're learning from what we learned with the AP600. So, we're not saying it's an uprate, but where we learned something about AP600 which is applicable, we're applying that learning, but it's not as if we're treating is as an uprate from something.

MS. STERRETT: Okay, then let's see how the question would read if that's the case. How would you approach a design where one of the constraints is to keep as many of the documents from the AP600, as much of the hardware, so you start with the AP600 as a constraint and you try and make as few changes as possible? I think some of these questions would still arise.

CHAIRMAN WALLIS: Well, we've asked that sort of question. They have the same accumulator

size, for instance, but they have a different core make-up tank size. We've asked about that, and it's not as if they're locked into it. They justify why this is so. They've learned from the AP600 experience that the accumulator was probably oversized for that purpose, but the CMT needed to be expanded. So, it goes along with what I said before. They've learned from AP600, but I don't think there are unreasonable constraints being imposed.

MS. STERRETT: Right. The question that I'm asking is if you do each of these changes as evaluating this particular change like accumulator size or number of main steam valves, number of feedwater heaters and so on, if you do each one separately, it seems to me you don't quite capture what you need to as opposed to looking at the whole thing altogether.

So, you may know that you need to uprate, increase the accumulator size, but how do you know of all of the stuff you've inherited, how do you know what's impacted by those changes, the changes you have made? What's the process? That's what I'm asking.

CHAIRMAN WALLIS: Okay, well, I think we ask ourselves some of the same questions you're asking.

MS. STERRETT: Okay. So nothing so far is new. That's all I raised before.

All I want to talk about today is there is some activity related to this topic since that July 18 subcommittee meeting that I want to talk about today for just a few minutes.

In that July 18 meeting, the NRC identified as an open item a QA inspection, and when I raise my question about the level of detail of the design and the question of how the process of choosing which documents and features from the AP600 were impacted and which were not, one response to the question was to refer to the QA inspections to be performed at a later date.

The QA inspection was performed in September of 2003 and the NRC inspection report made publicly available in mid-November.

CHAIRMAN WALLIS: 2003, Right?

MS. STERRETT: Sorry, 2003. I don't have a validator checking my notes, unfortunately. It now appears that the QA inspection addressed less than I realized. The questions I've raised remain unanswered after it so that the update is just that I had thought that this QA inspection was going to answer some of the questions.

Meanwhile, the date scheduled for final design approval has been moved up to coincide with the date the FSER is to be issued. So, I'd just like to talk about a few things in that report that are troubling, but to me at least, if not so apparent on the surface, things that didn't result in a nonconformance finding or are now considered closed out open items.

First, the QA plan referred to as a project specific quality control plan was definitively identified as the AP600 quality assurance program plan. It was recently made publicly available. The part applying to design control I think is just a single paragraph referring to unspecified written procedures covering the change control process. When I say unspecified, not specified in that procedure, not that it's not specified somewhere else.

So, it doesn't appear that it was part of the purpose of the QA inspection to really get into the question that I was interested in that I thought was important, is the kind of procedures needed to insure design adequacy for the unique kind of project the AP600 is. That is, the change control procedures deal with give me a change, and then I'll evaluate its appropriateness, what else is impacted and so on.

Well, how are these things done? Is it done one at a time? Is one person doing one part and one person doing another? That's the question.

So, a procedure that was meant to handle individual changes, that's what I'm asking. Is that the procedure that was used for at least I consider more overarching questions. Hence, the question identified above about whether there was a procedure and if so, which procedure it was that covered the overarching process of determining which features, calculations, and documents of the AP600 apply to the AP1000 unchanged and which are impacted by the new design, shall we say, remains.

The reason I focus on this is that it can't be done piecemeal. Many calculations use the results of other calculations, either directly by using values of parameters that are computed by other calculations or indirectly by involving design features or values of parameters based upon other design calculations. The order in which things are done matters.

Now, of course, I'm at a disadvantage here because this session is closed, so I really don't know whether you know, where this figures in what you're dealing with today.

Secondly, the report concluded that audits and self assessments performed for the AP1000 have not performed a comprehensive review of calculation or design analysis technical validity. One issue identified only as a weakness in the QA program and not a nonconformance was the inadequacy of Westinghouse's corrective action to an issue report identifying a problem that AP1000 self assessments did not get below the procedural adherence level and into the technical application of the calculation.

Another observation made throughout the report was that the audits focused on compliance with quality requirements rather than a review of the technical validity of the AP1000 design process.

CHAIRMAN WALLIS: This is, you're reading from?

MS. STERRETT: The QA inspection report.

CHAIRMAN WALLIS: By the NRC?

MS. STERRETT: Yes. And you can see the rest. The point is simply if these were ongoing problems at the time it was being -- the design was being developed, it's not the sort of thing -- it's hard to see how actions taken now on calculation, forms, procedures, and self assessments in the future are going to address that influence in the past.

Another observation that report was the inspectors noted that the technical reviewer performing the 2003 self assessment was the author of one of the assessed calculations. This didn't lead to a nonconformance either, but the QA report noticed that the inspectors questioned if the self assessment process was capable of reliably detecting technical deficiencies in the design control process.

Then that issue was to be dealt with in an open item, and the open item remarked that the scope of the internal audits and self assessments focused primarily on procedural adherence rather than the technical validity of design analyses and calculations. So, Westinghouse was asked to do what's quoted in A and B there.

"In light of the limited scope of internal audit and self assessment calculation technical validity reviews, please describe any methods and oversight activities utilized by Westinghouse to assess the effectiveness of the AP1000 design control measures, particularly those related to the technical validity of design products. In your response, describe any additional assessments or reviews that have been performed, including the scope of these reviews."

The portion of the open item appears to have been closed out based on a response given in November of 2003. The response in which the open item was closed out, though, is largely the offense of a particular corrective action. In other words, they were cited as a failure to do something that was required, and it was pointed out that actually it wasn't a failure to respond to a requirement. It was just a suggestion. So, that response did result in the closure of that open item.

Now, I'm not criticizing that at all. The point is just that it looked like this is a point in the review where this question would be dealt with, and actually the question still remains. That is, the response that was given really was a defense of a particular corrective action and wasn't really an attempt to establish in general the adequacy of the methods and oversight activities utilized by Westinghouse. I'm quoting now from what the request was -- to assess the effectiveness of the AP1000 design control measures, particularly those related to the technical validity of design products, end quote.

So, that's why I say that many of the questions I raised earlier remain unanswered in spite of the close-out of this open item about the technical

validity of design products.

There's one other comment I have only become recently aware of that bears a little bit on the issues here. In reading the publicly available documents, I see from the discussions of the construction inspection document, framework document for the 10 CFR 52 process, that it's not going to be possible to test all the ITAACS, the inspections test analysis and acceptance criteria. Rather, a statistical sampling method will be employed.

I just mention that because several times the response to my concern about the design detail in the 10 CFR 52 licensing process has been met with the remark that if there is a deficiency, it will show up in the ITAACS. And if all the ITAACS are met, the plant will perform properly from a safety point of view. I've never agreed that this response is appropriate, but now in addition, it appears that that kind of exhaustive check and balance isn't going to exist anyway.

My remarks today are not because I'm critical of nuclear power plants in general. I'm not or even of the 10 CFR 52 process per se, just that the 10 CFT 52 design process shouldn't be applied to a plant design submittal unless it's been designed in

the detail required by that process.

It seems to me there are questions that ought to be asked to provide confidence that the plant has been so designed. The recent QA inspection has asked some of these questions, but I think that in spite of the fact that the associated open item is considered resolved, the result does not inspire confidence. In fact, I think it's raised some doubts.

Now, how this relates to the safety basis of the plant, I wasn't going to go into that because I assume it's clear that numerous design aspects throughout the plant impact the safety analysis in various ways. I mentioned a couple of them in earlier remarks. One is just classification based on frequency of initiating events is one. Another is if you're counting on a capacity of a major component like a relief valve, of course the piping layout to that is going to affect the capacity, even if you've sized the valve properly, and that they do so even more when a risk based approach is used in the licensing process, so I won't go into that anymore, as that point was met with agreement when it was made on earlier occasions.

This concludes my formal remarks for today. Thank you for listening.

CHAIRMAN WALLIS: I'm trying to get some of your points. I think your point is that what we look at with AP1000 is the major components and how they are connected in a way which does not go into the detail of exactly where all the pipes would be perhaps in a system or how there might be auxiliary pipes or things like that and whether this pipe goes through that room or near another room so there might be other effects if this pipe burst, and if we don't quite know where the other pipes are or the other rooms or other instruments or something, we can't do a full assessment of what might happen. Is it that there's not enough detail in the design so that we can look at all the effects? Is that really what you're getting at?

MS. STERRETT: Well, it's close, but it's a little bit more dangerous I think, and that is that those details are there. There are so many of them that are inherited from the AP600 that we may think we know. The question is which of those were evaluated for the impact? It's almost harder when you've got a complete plant design you're making some changes to.

So, the question, I would just vary it a little bit from what you've said is, have you considered all the way these things would change?

It's not that there's missing detail.

CHAIRMAN WALLIS: Let's say, suppose that the steam pipe routing relative to the control room were an issue. I'm not going to say it is, but suppose it were. So, if something of that level of detail were an issue, and suppose that the AP1000 steam pipe routing relative to the control room were the same as in AP600 and nothing was significantly different, same pressures, temperatures and everything. One might say one doesn't need to revisit that if it's already been decided for AP600. So, there are certainly some things that carry over from previous, even at some level of detail.

MS. STERRETT: Right. I'm just asking the question about of all the things that would have to be looked at, what was the process used to decide which things we'll just say well, we used the same as on the AP600 and which not. I mean, I think the point was made again and again how many of the documents were the same, how much of the layout was the same and so on. That's why the question arises. Should it be so much the same? How was it decided? Was it one person? Was it decided by different people in different places who didn't know what the others were doing? Was there a committee of a bunch of select

people who did know everything that was going on? That's the question.

CHAIRMAN WALLIS: And also, the carry-over from AP600 to AP1000 isn't quite as easy as you might think because I think the staff members reviewing it are not the same as the staff members who did the AP600. There have certainly been changes on the ACRS. There are people on the ACRS who weren't here when AP600 was reviewed, and so they certainly have to start from the beginning. It's not as if they carry over too much memory from before. Of course, that memory might even be useful, not harmful, but they have to dig in at a level where they're satisfied when they didn't necessarily know much about AP600 at all. So, I don't think it's as if they're prejudiced by what they learned about AP600, if that's the concern.

MS. STERRETT: I wasn't concerned about prejudice.

CHAIRMAN WALLIS: This is a fresh look at a system which I think we're taking on its merits.

MS. STERRETT: Yes. Well, the concern was more that when I look at the DSER, how did arguments go? A lot of times the arguments go in terms of the such and such system has the capability of blankety-blank, right? Now, the question about detailed design

is okay, well, that was a capacity. Maybe it was upgraded for the AP1000. Maybe it was the same as on the AP600, but the question is the analyses are using sort of, a lot of times they're using a general system parameter of a capacity that will be -- it being provided is dependent on this kind of review where the details were reviewed to see whether with the changes -- it may even be that I think in the first time I spoke, gave examples of how maybe the system stays exactly the same, but there's some interfacing pressure that's different.

So, that's the kind of thing that when you do your analyses, I think, from looking at the DSER, you will often do things like in the safety analysis, I think you have to do things like well, what's the maximum relieving capacity of a valve or something like that, or what's the minimum, or things like that. So, that's the kind of thing I'm thinking about where you're just looking at a certain parameter. The question that would arise is what do we have to look at to guarantee that that parameter with all the changes on the AP1000 is actually provided?

CHAIRMAN WALLIS: Do my colleagues have something to add to this point? Staff or Westinghouse, do you wish to say anything at this

point?

MR. SEGALA: I guess at the last ACRS meeting in July, we had committed to responding to Dr. Sterrett's concerns, and we still plan to do so.

CHAIRMAN WALLIS: So, you're going to write a formal reply to Dr. Sterrett.

MS. STERRETT: I'm just curious. How was the process done? I mean, is that a question that you asked, and I mean, is there something I just haven't read or something that's not publicly available? Some report that said --

CHAIRMAN WALLIS: You're talking about the QA program in particular?

MS. STERRETT: Well, no, I'm talking about the overarching question of how these changes are orchestrated. In other words, if you had somebody doing this system and somebody doing this system, there has to be sort of an overall view.

MS. UHLE: This is Jennifer Uhle from the staff. I'm in the PWR section, reactor systems, and I can speak for my area of review. The design review has gone according to the standard review plan, which is used for all licensing, both licensing actions that come in for a plant that's already built and also for design reviews.

The way that we have approached it simply is that this is a new design, and we have input decks that are developed for the AP1000, and they are reflective of the AP1000 as built design, and we have analyzed all the Chapter 15 transients and analyses, as required by the standard review plan from beginning to end. So, we have analyzed the entire operation of the system.

MS. STERRETT: Okay, yes, I understand that. It was a matter of -- then the question arises about what -- you're using certain system capabilities in your analysis, and the point I raised earlier about the design details, guaranteeing those is really where the question arises.

MS. UHLE: So, are you questioning how the vendor or the licensee who is going to operate this plant, how they are assuring that they have actually built the AP1000 that is consistent with the as analyzed AP1000 design?

MS. STERRETT: Generally.

MS. UHLE: That goes back to the ITAAC process, which is not our area, so I can't really speak for the staff on that.

MS. STERRETT: Yes.

MR. KRESS: We can comment on your concern

about the statistical sampling in the ITAAC. The staff has assured us that it will be limited to a very few things that are amenable to statistical sampling. That's things like there's many, many, many components of that particular nature that have to be shown how a particular reliability or something, or particularly capacity So, you can't really investigate that many, maybe something like a relay or something of that nature. We use a statistical sampling on that, only when it's appropriate.

So, you know, it would be very few things that undergo that process.

CHAIRMAN WALLIS: So in general, they'll cover the whole field, but where there are a lot of common things, like relays, it might make more sense to sample not all of them, and have some real confidence that when they got knowledge about the whole set by looking at a smaller subset?

MS. STERRETT: When you have sort of a homogenous bunch of things.

CHAIRMAN WALLIS: This wouldn't apply to big items. They were looked at individually.

MS. STERRETT: Okay, thank you for listening.

CHAIRMAN WALLIS: Thank you very much. I

really appreciate having someone outside the nuclear club present questions and concerns. Thank you very much.

Can we move on to a closed session now? The staff has been waiting to present.

(Whereupon, at 1:30 p.m., the proceedings went off the record and immediately resumed in Closed Session.)