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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

THERMAL HYDRAULIC PHENOMENA SUBCOMMITTEE

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FRIDAY

JANUARY 18, 2001

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ROCKVILLE, MARYLAND

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The subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, T2B3, 11545 Rockville Pike, at 8:30 a.m., Graham Wallis, Chairman, presiding.

COMMITTEE MEMBERS:

GRAHAM B. WALLIS, Chairman

THOMAS S. KRESS, Member

VIRGIL SCHROCK, Consultant

STAFF PRESENT:

PAUL BOEHNERT

ALSO PRESENT:

JAMES MALLAY

BOB MARTIN

RALPH LANDRY

BILL NUTT

STEVE BAJOREK

JERRY HOLM

GENE JENSEN

YURI ORECHWA

I-N-D-E-X

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

(10:43 a.m.)

MR. LANDRY: I think I'll sit down for this next couple of minutes. Hopefully I won't say anything stupid to disclose proprietary material in the next few minutes.

MR. BOEHNERT: We'll shoot you if you do.

MR. LANDRY: What I'd like to do --

MR. BOEHNERT: He's going to go back to his original slides.

MR. LANDRY: Going back to my original slides. What I'm going to do is skip up to page six and then to page eight because we've just had the presentation on the review that is being performed on the statistical methodology.

Some of the comments that the subcommittee made with regard to S-RELAP 5 for the small break LOCA and I've lumped some of the comments together in just identifying three items. One thing the committee said was that the staff should insist on complete documentation before issuing a final SER. When we look at the material that has been submitted for the realistic large break LOCA on S-RELAP 5, our impression at this point is that there is a great deal of material and, in fact, far more material than we

typically see on any submittal of a code.

Whether it is the absolute perfect complete set, I'm not sure we could say right now but I would say that this is a very large set of material. It includes a full set of manuals on the code itself and on the subsidiary codes. It includes other documentation which is contained on the three CD roms which we have received.

One of the points that was brought up yesterday by Professor Schrock was looking at the decay heat model and how that model has been substantiated. The vendor has produced licensing calculations or calculation notebooks -- excuse me -- along the way which they do on every calculation they do. Normally, we do not ask for submittal of calculation notebooks. They are available for audit at any time. We will discuss with them further though whether part of the justification for the decay heat model which they are using should be supplied as additional material, perhaps in an RAI or some submittal form. But we will discuss that with them further. We do not anticipate asking for the calculation notebook, but perhaps we should put on the record an extract from that notebook which justifies what they have done.

Another comment that the committee made was that the staff needs to consider how broad-based the assessment of realistic LOCA should be, not only to ensure adequacy but also to the measure of uncertainty. We've been making comments throughout this presentation. Doctor Orechwa just gave you his views and the approach he's taking to doing the review, and we will continue to discuss this, look at developing his views further, and we would look forward to feedback from the subcommittee on your views on what he has said and the approach he has taken.

Another comment that the committee made was that there should be an independent evaluation of code runs when S-RELAP 5 is submitted as realistic LOCA. We are doing that, as I indicated yesterday. We have at least one person now --

CHAIRMAN WALLIS: That means running the code yourselves.

MR. LANDRY: Running the code ourselves on input models but also running parts of the code, looking at models and sub-routines within the code, varying parameters within those models and correlations to determine the effect on the result. We have a person who is putting in time working with

the code, worked from the source code, modifying the models, modify parameters, recompile the code and run the code. That would, of course, be taken to be understood that that is a modification we have made to the code and it is not the frozen code, that the results that we get are looking at an effect of change within the code and would not be taken that this is UMAR01 or whatever the latest frozen version of the code is. So that would have to be that understanding, that these are modifications we made to try to understand what the code does.

As part of that effort, we will be looking at some of those models and some of the equations within those models and spot checking. Are they programmed to represent the model equation or the correlation that is in the documentation? So we will be doing independent evaluation with regard to some spot checking also.

So I hope that those comments respond to some of the five points that you had in your letter. I lumped a couple of those together in these responses, but we are taking those points that you made quite seriously and we're trying to respond to them and we're trying to factor those into our review on the realistic large break LOCA.

Some of our conclusions. We do feel that the S-RELAP 5 submittal is probably the most complete we've seen to date.

CHAIRMAN WALLIS: Of any code?

MR. LANDRY: Of any code. At least in the last several years, this is the most complete of any code we've had submitted. The documentation is massive. All the pertinent documents for S-RELAP 5 have been submitted and for models that are carried in as outside models into the code.

The effort of the review is focusing on a number of areas that have not been previously reviewed in the code. There are some things that we will be going back to look at, but I've outlined some of the specifics that we are looking at in this review. Again, due to our staff resources, we can't review everything in the code. We have to pick out what has not been reviewed and items that we feel are very important and focus very heavily on those. The review will include independent evaluation of the models and the code and we do, as has been said a number of times the last few days, have a very aggressive schedule for this review. We are doing our best to adhere to that schedule. We're pressing the staff and the consultant to adhere to that schedule to get information and

questions very quickly because we want to proceed with the schedule.

MR. KRESS: Does your exercise of the code include the ability to do the non-parametric statistics?

MR. LANDRY: We have not planned to do the statistical analysis with the code. We are, again because of staff limitations, there's only a certain amount we can do and my feeling is that it would be more beneficial and better use of the resources if I focus them on areas of the code that should be evaluated internally and independently.

MR. KRESS: You will evaluate the ranges--

MR. LANDRY: That is part of the questions that we talked about yesterday and part of other questions we'll be asking to ensure that the correlations and models are being used within the range of validity and applicability. And Yuri brought up some of that this morning, too, in his discussion, concern that you're using data properly and correlations properly.

If there are no other questions, those are the conclusions and where the staff review is on the code. I've taken a number of notes the past two days, a number of items that we're going to look at. One of

the points that we're going to discuss internally is what can we do in the way of looking for compensating errors or effects.

One of the examples that always comes to mind on that is talking about the LOFT test L-22. When we ran the L-22 test, as one that was managing the project then, I was sitting there in the control room when they ran the test and we had a beautiful plot that was done with RELAP 406, I believe it was, up on the screen and here comes this plot and here goes the temperature screaming up, almost overlaid the blowdown --

CHAIRMAN WALLIS: -- heat up or something.

MR. LANDRY: The blowdown part overlaid it beautifully and the curve drops down and goes on up to reflood and here comes the temperature screaming down. We thought, holy cow, what did we do wrong? And then the temperature goes back up. So afterwards we spent, after we got some rest because we worked about three days without sleep before we did that test, after we got a little rest, we started looking at the data trying to figure out what in the world happened and found out that we had indeed had a core quench. Right away at that point, the two people that had the codes, INEL with RELAP and Lionel Los Alamos with TRAC,

started trying to figure out how they're going to predict this. Lionel came back with a calculation that overlaid the quench perfectly. They used a new correlation. We sat back and looked at that and started looking at the correlation and looking at it. We said, you got the temperature right but you don't have a single other parameter right. Every single hydraulic parameter is wrong. So you got the right temperature for the wrong reason.

Prime example of a compensating error and a big concern that we do have is we have to make sure to find some way to determine are the values we're seeing right for the right reason or are there compensating errors?

We want to look at break flow split a little bit on these double-ended guillotines. How is the break flow being split between the two ends of the pipe? The comment that Professor Schrock was bringing up about the split break is very valid. There are no data for a split break. There are data for T-flows and, indeed, the split break starts as a T. But it transitions from a T to flow from two directions into what should be a T, and there are no data that I'm aware of to do that. So we have to give some more thought to that.

Critical flow calculation and model. One of the things that we specifically tasked our contractor to look at is the critical flow model, the break flow models. So we'll be looking at that further.

CHAIRMAN WALLIS: I think we'd like an explanation of how you go from two fluid to homogeneous or whatever and how things are fitted together.

MR. LANDRY: That's one of the things that I think we'll be asking Doctor Ward to look at further. The regulatory implications of biases. That's part of a discussion that we'll be having with Doctor Orechwa and the views on the uncertainty analysis, I believe.

We'll be looking further at things like UPTF and some of the other tests and the applicability or how you deal with some of the oscillations that have been shown and discussed in this meeting. So those are a number of the notes that I have for further input we'll be looking for in the transcript of the meeting and we'll also be waiting to hear from the subcommittee and from the subcommittee's consultant any additional comments, especially with regards to things that you think as part of the

independent evaluation should be looked at within particular models. We have a person dedicated to doing this work and I would like to have the specifics to keep her busy so that we look at the right questions instead of come up in August and say, you didn't look at the right questions. I'd like to use the person correctly and look at some of those right questions plus the other work she's doing.

CHAIRMAN WALLIS: We can not promise that there won't be questions in August. My experience is that no matter how much you go over this, there's always the chance that something will come up.

MR. LANDRY: I realize that.

CHAIRMAN WALLIS: But we don't want to surprise you in August.

MR. LANDRY: We'd like to give the best shot we can.

CHAIRMAN WALLIS: We simply don't have time. I've had that experience of reviewing something. You think you've done it and then you find out that it triggers something and you dig further into something else and you find something you didn't know you were going to find. Can't be sure.

MR. LANDRY: One final comment. A comment with regards to statistics and liars and statisticians

is often times attributed to Mark Twain or Samuel Clemens. Actually, it originates with Disraeli and Mark Twain was quoting Disraeli.

CHAIRMAN WALLIS: I would think it's probably been used before that. Almost as soon as they were invented, someone probably saw the potential.

MR. LANDRY: Julius Caesar may have talked about the statistical evaluation of whether he should be stabbed or not.

CHAIRMAN WALLIS: Well, they probably had 59 conspirators to make sure.

MR. NUTT: Then you have a 95 percent probability he's dead.

CHAIRMAN WALLIS: Well, I think that we don't have any ACRS letter on this and we're not to that point. What will happen is that I anticipate that I will make a very short presentation to the full committee saying we've had this meeting and we've heard various things and this is where we are in the process.

Do any of my colleagues wish to say anything at this time before I wind up the meeting? I'm looking forward to your comments by email so that I can prepare for the full committee meeting.

MR. BOEHNERT: I think the only thing we have to sort out is this business about what we want to transmit or what we have to transmit to the staff and Framatome and how to do it.

CHAIRMAN WALLIS: I'd like to know what we transmitted last time.

MR. BOEHNERT: Yes, we got to dig that up. Absolutely.

CHAIRMAN WALLIS: Tom, do you have any last minute remarks for us?

MR. KRESS: No. I think -- well, you covered my items that I think he ought to think about already that I had on my list. I might want to say overall I was favorably impressed with the approach of using PIRT and the uncertainty and sensitivity to determine the 95/95 values for your acceptance criteria. Looks like a good approach to me. There may be some problems with some of the details but I was impressed with it.

CHAIRMAN WALLIS: Virgil.

MR. SCHROCK: I think I was impressed in many ways and disappointed in a few others. I think I've commented on the places where I thought there was a problem. I'll try to make those more pointed and clear in my written comments. I do think there's a

problem with this so-called best estimate approach being picked apart this way and to have continuum of things ranging from Appendix K method to best estimate method. Not very much clarity about what it is that finally guarantees the thing is satisfactory.

I guess the decay power is the key one that we talked about. Ralph's about not requiring these notebooks, I guess you need to think about whether the requirements that you have are going to serve adequately in this environment. Seems to me that the key point there was that if you're going to claim that what you have is a conservative approach to the thing, you have to demonstrate its conservatism. I don't see in that case any other way of doing it than doing a large number of best estimate calculations which are exercising the full range of technical information in the ANS standard that's now being done.

CHAIRMAN WALLIS: Well, I was hoping to stop at 11 but it's gone.

MR. BOEHNERT: Just barely.

CHAIRMAN WALLIS: And the reason is that we started a minute late. I'd like to thank Framatome. I think a lot of useful information was transmitted in this meeting and it's given us a good

start in our review of your submittal or the role that we play in the review process. I'd also like to thank you for your general appearance of openness to discuss questions, respond frankly. That's been very helpful. We don't have any comment yet on the documentation I think because we haven't really had time to study the details. It's a lot of stuff, but we look forward to that, too.

So thank you very much. We'll see you again some time in the future and hope this all works out well for all of us. Thank you.

MR. HOLM: Thank you.

CHAIRMAN WALLIS: The meeting is adjourned.

(The meeting was adjourned at 11:05 a.m.)

CERTIFICATE

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

Name of Proceeding: ACRS Thermal Hydraulic Phenomena Subcommittee

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.

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