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BY THE
UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

MARCH 28, 1995

The contents of this transcript of the proceedings of the United States Nuclear Regulatory Commission's Advisory Committee on Reactor Safeguards on MARCH 28, 1995, as reported herein, is a record of the discussions recorded at the meeting held on the above date.

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

THERMAL HYDRAULIC PHENOMENA SUBCOMMITTEE

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OPEN SESSION

+ + + + +

TUESDAY

MARCH 28, 1995

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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 8:30 a.m., Ivan Catton, Chairman, presiding.

SUBCOMMITTEE MEMBERS:

IVAN CATTON	Chairman
THOMAS S. KRESS	Member
ROBERT L. SEALE	Member

ACRS CONSULTANTS PRESENT:

Virgil Schrock

Wolfgang Wulff

Novak Zuber

ACRS STAFF PRESENT:

Paul Boehnert

Richard Savio

ALSO PRESENT:

Farouk Eltawila

Gary Wilson

Brent Boyack

Marino diMarzo

Joseph Kelly

Wayne Hodges

Alan Levin

David Bessette

Marcos Ortiz

Paul Bayless

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

CHAIRMAN CATTON: Paul has on this thing follow-up issues. I guess you're going to dredge them out of your notes?

MR. BOEHNERT: I sure will.

CHAIRMAN CATTON: A lot of promises were made. I don't remember what they all were.

MR. BOEHNERT: I got most of them on here.

CHAIRMAN CATTON: For the full committee meeting. I don't know when they are scheduled.

MR. BOEHNERT: 1:00 to 3:00 on April 6.

CHAIRMAN CATTON: Thursday?

MR. BOEHNERT: Yes.

CHAIRMAN CATTON: I think what I'd like to do is we have two hours. I'll take the first 10 minutes. I am giving this in real time, so you'll have to adjust.

Farouk's overview, I think if you could cut it to about 15 minutes or maybe even a little less.

Joe Kelly, the RELAP5 work. Maybe 30 minutes. Just sort of highlight things.

Then I think the Dave and diMarzo team did such a good job in describing what we've learned from ROSA and OSU. I think 50 minutes, maybe.

Then the last item might be future plans, summary, what are the hard spots, what are the schedules

and things like that. And close it up, for a total of two hours.

The only thing in those times that's firm is my 10 minutes. You guys can do what you wish with the remaining hour and 50 minutes.

Now what I would like from you three, before we all go our separate ways on Thursday, I'd like your inputs on what you have heard in the past couple of days.

Well, why don't we do that. Why don't we just start with you, Novak. But I would also like it in writing.

DR. ZUBER: Okay.

CHAIRMAN CATTON: As a matter of fact, the writing that you have there, if after you give it to me orally, you give it to Paul, he'll type it up for me.

DR. ZUBER: But he would have to decipher this at any rate.

CHAIRMAN CATTON: He can.

DR. ZUBER: Let me start with the program. I call this section turnaround. It was a turnaround. I think this program has undergone a dramatic change from the August meeting. It orders a magnitude of improvement.

At the last meeting, I think it was in August, I don't know exactly the date. That meeting displayed managerial and technical incompetence. It was a

disastrous meeting.

Now the program has undergone a change. It is well-organized. The presentations are very systematic, scrutable. They displayed a very good technical thinking. I think it was gratifying to look at the way that it was structured, they were presented, and the thinking behind it. It was excellent and very gratifying.

Another gratifying point was the use of the consultant. Finally, RES is making use of the best talent to bear on this problem. I think they should be complemented for it. My advice would be, make as much use as you can afford.

I would also recommend then for them to I think it would be helpful at least, ask the consultants and the members of the committee if they would send to Paul the letters by the different consultants.

CHAIRMAN CATTON: We were told that we would get them.

DR. ZUBER: Good, good, good. I mean, this is what I wrote.

The speakers were very responsive to the technical questions and comments. They displayed good technical thinking in the approach to the problem. I hope they will continue this in the future, and also to respond to our questions, our advice. Why they take it, why they

discard it. There should be kind of a paper trail on documentation on response to the questions and comments of the consultants.

In closing, I would like to complement the management, the staff and the contractors for generating this improvement. This is kind of general.

Now let me go on to PIRT. I view PIRT as a living document and I agreed with Negali (phonetic) and RES.

The difference between the state we are in now and the one when we started this year, CSAU is quite different. For CSAU, when we established the PIRT, we had tons and tons of data. So it was easy to establish the final PIRT.

Here, we are learning as we are testing and running. So it's a PIRT which is continuously is undergoing change. I think the approach we heard was good. It was systematic. It was documented. More than that, it was scrutable and well organized.

I don't see any problem with updating PIRT as much as it needed. I would support very strongly the comments by Wolfgang that they should also document why something is not applicable. I think this is important.

You know, somebody may say, "Did you think of this, did you think of that in starting the PIRT?" Well,

it should be there.

There should be a paper trail. This is an Agency concern. There should be always a paper trail to see how we made the decision and on what basis. I think if we discuss something that's not available, I think we should document it, why it's not important.

Another thing I would also support is that the PIRT should be tied to the scaling. I think the scaling could really give support and verify. It's a quantitative method of supporting a qualitative judgement based on PIRT. I think a graph like Wolfgang, or maybe modified, should be really devised to put and compact all this information in one format.

Now let me go to, well anyway, I was pleased with the PIRT. With the analysis, it was very gratifying to hear the technical comments and learn about the physics of the problem and the exposition and the effort that the staff went to understand the phenomena. I think it's very good and should continue in the future.

There are some problems I can see where the cause may not be really applicable and useful in this problem. In this sense, I would really encourage the staff to continue this effort like Mario and Dave, along the line of Dave and Mario. But they should also be supported by scaling.

Again, they should document why something was run high or low, and then have a paper trail on that. Especially if something is discarded. They should provide the basis, why was this process discarded and the reasons.

Going to the scaling. We didn't hear much about it, and I understand this process is ongoing. I would like to receive and maybe you already have received, all the handouts of the meeting they had in Idaho. The minutes of the meeting, the recommendations and conclusions.

The only comments, anticipating the future, I will say we should not really succumb to the NIH, not invented here syndrome. I think we should proceed as soon as possible. I think a timetable would be very useful to anticipate, to see when these results will be available.

I think starting from what Jose has done, and then continuing with the top down approach would be very useful. I don't see that every aspect that Jose has done I am in agreement. But generally, the approach is excellent. I think this is the first really good approach to a systematic analysis.

It can be improved of course. And we can start from there to go farther down.

I would recommend obtaining a consistent set of scaling and apply it to ROSA, OSU and SPES. I think we

would learn much more about the behavior of this facility if we brought them on a dimensionless, the data, in terms of these dimensionless groups.

We can use the scaling for several purposes. We could use it to assess the analysis and support the analysis along the lines of Dave and Mario. We can assess the effect of distortion of the different facilities. We can use it to support the conclusions of PIRT. We can use also to develop dimensionless groups to plot experimental data. As soon as we have it, we can improve our knowledge.

This is just understanding physics. See, in the old plans we had time to get familiar with the problem. Here we have to be very fast very soon. Unfortunately, we lost three years. But maybe we can recoup it. So I think if you do this early enough, we can then use it to analyze the data. This is on the scaling and analysis and PIRT.

Now there is another area. As I call this problem area, some people think they don't like to hear the word problem, area of concern or whatever you want to call it. Let me identify several concerns.

One is the water hammer. The other one is how to deal with the water hammer identifying which condition it can occur and where.

The second item is dealing with thermal certifications in both, in CMT and the horizontal pipe. Our codes can not really predict it at all, very poorly. How do deal with these two problems.

Another problem I would identify is we should really look in a sense that we have cold water coming in contact with the surface, hot surfaces. What is the potential for thermal shock.

I think these problems we may face down stream. But I think the sooner the address them, we have enough time to look in advance to see how we can schedule our work and our resources to address this problem. It will be very unfortunate to face some of these questions at the time of certifications. I think if we address them early enough, we may find a resolution. But if we have to face them within six months or three weeks, there is nothing you can do.

So I would suggest therefore, to identify potential safety problems, accident scenarios and locations where these phenomena, especially water hammer and thermal shock can occur, and then assess the significance of the safety.

I would also suggest that, and you have done to your credit, use your consultants to this effect. For the thermal shock, you may look for somebody else. Then I

would suggest that this work should be really documented. If there is not water hammer problem, let the consultant, whoever does it, say there is no water problem because of this, this, and that. They should be documented. This is the document on which we can make decisions, and there is somebody's name on it. If he's an expert, he has the weight and the responsibility. They will do the same thing for the water hammer and thermal shock.

If you have to address this problems years from now, someone may be dead, some of them may be gone in Europe or whatever. There is still a document that says how we arrived that this decision.

I think one great contribution ACRS can do is to really put the emphasis that every decision is documented and there is a reason on which you make and remake a decision.

Another item of concern is really the codes. I am not sure that either TRAC or RELAP are viable tools, will be very useful to us for this problem. One of them is that we have the problem, which our codes were historically poor was condensation and certification and labor tracking. These are the phenomena which listening to Dave and Mario, really this is really the crucial things. Those are the CEOs of all these PIRT, it's the condensation and certification.

So the question is, and I think this goes to RES, if down the road you can see that we can not afford to use this code effectively, what alternative solution do you have? I think it's better to start thinking how we can address these problems. If we have to do something else, what that else should be. These should be addressed early enough so that we can gain some time.

I would then think and assess other alternative tools, how we can address this problem. We can maybe use discords for something and maybe use something else.

But if this is addressed early enough in time, we should have enough time to resolve them before the certification date.

My other recommendation I would make in connection is with reporting the compilation of core calculations, the experimental data. I would recommend that these reports get a section called "Lessons Learned." I think there's lessons to us from each calculation.

They should address several items. One, what is the physics. What did you learn from the physics, in physics from this run. What did we learn of code capabilities, to model the important phenomena. If this was identified with PIRT. Three, identify code efficiency, deficiency.

If you list them, and then not only list them, but what are the implications of these deficiencies to the safety issue. I mean throughout the calculations. Some of these deficiencies may be zilch. No sense spending money on them.

But there should be somebody's name on it. You see, he made this recommendation. This is not important. Then, RES can make a decision, we are not going to put one in it.

Or if it's important, then there is a documentation that says, yes, this was important, but RES didn't support the funding. See there should be a paper trace on the responsibilities, and identify what are the problems. I would say that this third item is code deficiencies and evaluation importance, reactor safety.

Then the last item would be what recommendations are you making. If you want to make improvement, what this improvement is and how are you going to deal with it?

And now, I would like to make a final comment. I am not making this as a consultant to the ACRS.

I'm making this comment as a technical man who is very much interested in this technology, and I'm making it because, as an old man, I can always be done away by a jealous husband.

(Laughter.)

CHAIRMAN CATTON: You sound like that fellow who, at the last awards, did the one hand push-ups.

DR. ZUBER: Yes. Well, whatever I can. I could make a comment, but this is on the record, so I won't go on -- really, I want to go on the record with this statement. As I said, not as a consultant, but as a technical man.

I would like, really like to compliment the ACS committee. I don't that the change in RES and the quality of the technical work which you have heard, which have been into effect today, and really, it was a great success for RES, and had it not been for the activities of the ACRS Committee, the turnaround is really, was due to your insistence and willingness to maintain high technical standards.

Otherwise, you see, Worfgang and I, and Virgil, and the rest, we are like dogs. We can really bark, but we cannot bite. We're really -- You can -- you can -- well, that's -- no way to -- I am coming to that. You can write a letter through the Commission. You have the bite.

No, we have also the bite. If I'm so unhappy and frustrated, I can go to a technical journal, and put it in writing, and in public, and then see how the things

unfolds, but hopefully this will never occur. So, you have the bite for it.

And actually, the turn-around is essentially due to --

MEMBER KRESS: Actually, Novak, we just bark louder.

DR. ZUBER: Well, whatever it is. Let me say why I'm saying this. The debt of this technology would be really the technical work which is presented and done by this Agency and industry, becomes the butt end of jokes in the technology, or ridiculed by the public.

If the work is so back that any housewife can see how the hell they made such a stupid mistake, this'll be the end of it. And I think we cannot afford it. So, it is essentially, really, to maintain.

And I look at your activity of the Committee. You are the last and only independent barrier to maintain technical quality. Like working in the industry, I work in government. Each one has a cultural -- culture which propagate, each one under different pressures, in making judgment, a decision.

The only one which I think is independent is your Committee. And I think it is up to you really to maintain high technical -- not maintain, but demand high technical standards from NRC staff, researchers, NRR, and

from the vendors. I heard over the years work by some vendors which were really -- would not be accepted even by -- when I was at UCLA as a senior student, I think that's a disservice to this technology. And I'm sometimes surprised that they're not already -- at these -- ACLS meetings.

There should be some standards which are not acceptable to this technology. And I think it's up to you to maintain it. I think all of us should recognize and support, and promote good technical work. And by the same token, we should never be afraid -- to identify and discuss technical garbage. And I think we should continue to do that.

And now, as I said, I made my comments on all aspects I wanted to take, to discuss, and I'm ready to face any jealous husband. (Laughter.)

CHAIRMAN CATTON: Thank you, Novak. Your turn, Wolfgang.

DR. WULFF: It is a[illegible] how to follow that.

CHAIRMAN CATTON: I don't know what you're going to say.

DR. WULFF: I have checked off from my list here the things that Novak mentioned, though I don't want to repeat them, I do want to say, however, that there is a general improvement in the -- the presentations. That I

agree with Novak very strongly that we have made improvement -- with the presentations of last year.

The theme of this two day meeting was PIRT, and Novak said most of them needs be said, I am concerned that Los Alamos has no intention to confirm, as I had hoped -- I am however happy that INEL planned to confirm that PIRT -- which is now subjective, and to make it more objective, as it is.

As far as ROSA, I am concerned that NRC's presentation claimed that the scaling was accepted by the consultants. I did not see that from their -- comments. And perhaps the consultants didn't see our comments on ROSA scaling. All the experts saw is some report that we did not see. So that there is some very strong discrepancy of our findings on ROSA scaling.

It may not be that. I'm not saying one way or the other. But we didn't see a scaling analysis yet. And that was still one of the open items that NRC should close in one way or another.

The same is true for SPES. We never saw any scaling. We don't know what the distortions in that facility is. I am -- on the one hand concerned about the long time during which the OSU scaling from Jose was isolated, and had no impact on the PIRT development in either INEL or at Los Alamos.

I was very happy to hear here that it is not proprietary, except for -- he mentions in trade -- trade related information. But that the intellectual content of that report is available. And this is what we were told yesterday. And I am very happy, and I urge that people read this although I think we need to look at the system wide momentum balance, and its scaling.

And particularly where we deal with the interactions and possible oscillation. Not oscillation. That should come from that global momentum balance.

The data need to be reduced that David presented, in terms non-dimensional groups. We need to be aware of what the reference time that scales times is for every phase. I don't think that awareness is present yet. And before I go on, I would like to say to OSU, that scaling report is the best thing I have seen in scaling.

DR. ZUBER: Since Hochreiter was not here yesterday, I made the same comment. There may be items we disagree, but I said, you should be complimented for that work.

DR. WULFF: Then moving on, my question that was stimulated by the very systematic elimination of what we might call red herrings that I related to the test facility, but have nothing to do with the nucler power plant.

I think that was very systematic, convincing, and traceable. But the reverse has not been answered yet, and needs to be answered. And I think that should be one of the action items we have. That is, which phenomena are we going to miss in our experiments, in all three facilities, that might occur in the nuclear power plant?

MEMBER KRESS: Wolfgang, I've tried to answer that question in the past, and haven't seen any real technical way to do that. Do you have any suggestions on that? I think the only way to do it is by expert opinion, frankly.

DR. WULFF: I believe that is part of it. On the other hand, if we have recognized non-dimensional space that is covered by the power plant. And the one that is covered by our three test facilities. And we see that there is a domain that in -- in the test -- in the NPP nuclear power plant that is not covered by any of these tests. Then we have a very worrisome thing.

And I think that's the second part of it. If experts like Peter Griffith, and -- and Sancho Banerjee, and so on, agree that we have covered, I think it has to be the right experts. It should not be code developers who --

MEMBER KRESS: It has to be real thermal hydraulics people --

DR. WULFF: Okay.

MEMBER KRESS: That have had a lot of experience.

DR. WULFF: Yes. So, water hammer is -- was covered by Novak. My big concern is about the codes. And I would like to supplement what Novak said, by saying, when you impose on the user to make technical decisions that, maybe it's my personal opinion, should have been the code developer, then you have to give clear and unique instructions, such that two different non-developers come up with the same answer.

If you don't have the instructions to achieve that, then the documentation is not right. And the code is subject to a wide variety of uncertainty. And -- and to ask the user to choose between Wallace or Kutataladze, these choices should be -- if they have to be made, they have to be very clearly written down. And I think to the upper tie plate, Kutataladze doesn't belong.

MEMBER SEALE: Wolfgang, wouldn't that choice, though, have to be couched in terms that the technical expert, the thermal hydraulicist, in this sense, rather than the code developer could best set forth for the user to make his decision with, you know?

What I'm saying is that the check sheet, or the instruction sheet that would tell you -- that the user

could use to decide which road he was going to take, is not really a code developer's worksheet. It's really more a --

CHAIRMAN CATTON: That's true.

MEMBER SEALE: -- a technical worksheet. And if that's the case, then it's not clear that the code developer couldn't have gotten an adequate set of instructions in the first place that would have allowed that decision to be embedded within the code.

CHAIRMAN CATTON: Yes. But there are different circumstances that you are going to use the code.

DR. WULFF: Well, my contention is that if you have a reactor, it has tie plates, and you should have a tie plate model, and not call it one of the general junctions. Junctions with which you could, in principle, in these codes with their flexibility, connect an interior node of the core with a turbine, which is -- makes no sense. But it is there.

That capability is there. And because of that flexibility, there is a tremendous burden on preparing decks. And there has to be information generated that could be totally automated for internal nodes. You have to specify for two identical nodes how they connect. We know exactly what they ought to be. And you ought to --

deal with the core, rather than with all the elements in the core.

So, but that is an aside. My contention is that there ought to be an element for a lower tie plate, and for an upper tie plate, and that you insert. And at that time, it's up to the code developer to determine what kind of counter current flow limitation ought to be in there.

Then I had -- this is my final concern, problems with using experiments for ranking. I think the justification that we heard here is subjective. That there ought to be somewhere a documentation of how a result is used. If you have pathon recognize, you recognize phenomena. That I can tell.

But whether they are important, important to the inventory of the core, or vessel, how that connection is made has to be written down. And the words we heard were not convincing, is my conclusion.

CHAIRMAN CATTON: Thank you. -- what's left.

MR. SCHROCK: There's hardly anything left, but I'll try to add a little bit. As I see it, it was predominantly a good news meeting. And to a lesser extent, some bad news, too, that I -- I think needs to be commented on.

In terms of the PIRT, and that effort, the

idea that was explained at the outset of the meeting, that research has a systematic approach to experiment and analysis. And are going to convince us of that.

There was an invitation at the outset about forming a partnership with ACRS. I think it's similar to words that I heard last summer about a new era of greater openness and cooperation. And I think in many ways that has occurred. There are some significant ways in which that has not occurred. And I'll -- I'll come back to that one.

The use of the experts in the PIRT activity looks excellent. I think that the communication of the information that's being developed there to this committee should be improved. That is, the little report that we got, and the mailings that had been developed at INEL is very sketchy, and it leaves out important details about who has said what on hard technical issues. And I think that's an important part of the information that relates to the documentation, suggestions that both Novak and Wolfgang have made already.

And I -- I thoroughly endorse that idea. We need to have a lot more attention paid to having good documentation of all of the aspects of this program that have already been touched on by the two previous consultants.

The PIRT from -- from Los Alamos on the TRAC, or for use of the TRAC code for the large break, probably is not of terribly great concern. But I -- I would say this, that while the participants in that are all good people, there is a -- a very strong code developer's mentality bias within that group. And I think they would have done very much better to have gotten a few consultants in, that didn't need a large number, but they should have gotten a few additional people from outside that would have brought a different perspective to it.

On the RELAP5 development, I was very disappointed, and this is what I was referring to by the negative aspects. And it takes two forms. I think one is that the subcommittee put a lot of efforts into reviewing the documentation of -- of RELAP5, I guess nearly two years ago. I don't remember the exact time of it, but it's quite a long time ago.

We have not had good feedback. Feedback has been almost non-existent. Now, what we heard today is that there is a kind of crash program which is getting some things into the code so it can be used.

In the certification program, some of the things I think need to be commented on. The code development has proceeded without interaction with the ACRS, as far as I know. I haven't attended all of the

meetings. But I think I've gotten minutes of all the meetings, and I do not think that there has been a suitable level of feedback of the activity at INEL on code developments in support of use of this code in AP600.

The review of code documentation -- models and correlations provided by this committee appears not to have been considered. I think from what we heard this afternoon, this is hard to see that it could have been considered.

Documentation of the new models, and assessment of the new models is lacking. That is, the documentation part of it, particularly. The assessment is proceeding without peer review, as far as I can tell. It seemed to me that there is need for some peer review on the models that are being modified in the code, prior to the expenditure of the resources to go through the assessment activity.

The stratification model, that there was quite a bit of time devoted to, I think is a misnomer. It looks to me like it's a level tracking scheme. But there are ways in which stratification needs to be modeled. And we have talked about that in earlier meetings. I don't think that we're getting to a satisfactory place on that one, on the route that we're taking here.

I would like to go back to the positive side,

and say I was really very positively impressed with the work, that shows a lot of originality, a lot of careful thought, and open mindedness, in getting at the interpretation of all of the physics of what's happening in the system as revealed by the test data that are in hand so far.

So, that's all I have.

CHAIRMAN CATTON: Thank you, Virgil.

MR. SCHROCK: I have one --

CHAIRMAN CATTON: I'd like you guys to -- yes. One minute. I want you to write something down for me, too. And again, if you could leave it before the conclusion of the meeting Thursday. Now?

DR. WULFF: I overlooked one of the items. I would suggest that before new models are implemented in the code, that they would be peer reviewed somewhere. The reason for my saying that, is that with the thermal stratification, the first attempt was made to change the numerics.

But it was not really a well thought out step. We heard first that the volume was sub-divided, and we had an interface. And then we got a sharp rise in the temperature rise of these core make-up tank.

And then, it seems to me a second step is taken, and now to get in the diffusion. My experience is

that as soon as you make changes in the code, you spend a lot of time. So, before you make any change in the code, you should really have the model thought out, peer reviewed, accepted, and perhaps tested out in an analytical, in a closed form solution type form.

And then spend all the time to get it working in the code. Because that usually takes about three times as much time than to develop the model right. And -- and I think we have to change the philosophy, or the mindset in going into the code, changing the numerics, then making anothe change in the -- change it first, make the change on paper and pencil before you get into the code.

CHAIRMAN CATTON: Well, in that regard, Wolfgang, I notice they have a code development and assessment sub-group, made up of their thermal hydraulic consultants, and it seems to me that it would be in order that they bless the model before the code development, the actual coding begins. I see some nods over here, yes.

DR. ZUBER: No. You see, the point is --

CHAIRMAN CATTON: I'll give you a chance in just a minute.

DR. ZUBER: I'm looking at this list and -- well, okay. You see, I think you want a developer for -- TRAC and one from RELAPS, that's fine. But I wouldn't put also some thermal hydrologists.

CHAIRMAN CATTON: People who have done modeling.

DR. ZUBER: Modeling, right. People who are really familiar with modeling, and with the data, from experimental and modeling side.

DR. WULFF: But I think you've -- you've -- Graham Wall had blessed the stratification model before any attempt, or any money had been spent to change the code, would have been an advantage.

CHAIRMAN CATTON: Oh, I think so, too.

DR. ZUBER: See, but I would add maybe one more or two more, really, thermo hydrologists and modelists.

CHAIRMAN CATTON: Yes. I made a note on that. When I looked down the list of names, the person who has done thermal stratification kinds of problems in the past is Banerjee.

DR. WULFF: Yes.

CHAIRMAN CATTON: When I was editor of JHT, his paper came through. So, he's done that kind of thing. It might be very helpful.

DR. WULFF: If we are looking at the list, I think the people who code documentation review are to be revisited.

CHAIRMAN CATTON: The suggestion has been

made.

DR.WULFF: Okay.

CHAIRMAN CATTON: What I'd like to do, if Farouk, would you like to make some comments?

MR. ELTAWILA: I'll start with the last comment about before we implement model in the code, that we should peer review them. And that's exactly what we intend to use this thermal hydraulic subcommittee model development, assessment subcommittee for that purpose.

And as a matter of fact, the ACRS, in my previous life in the -- made the same recommendation. We have implented that recommendation, and it's being -- it's delayed the development a little bit. But at least, when we know, when we put a model in the code, it's robust. It's endorsed by other experts in the field, and we have no problem with it.

So, I think that's a good idea, and we will follow it up here.

CHAIRMAN CATTON: You need to be sure, then, the subcommittee that gets the assignment, that it has the proper balance.

MR. ELTAWILA: Absolutely. Somebody who did work in that area in the past, and who understands the phenomenon, and can shed light about his experience to have the code development. That's -- it's not going to be rigid that these people will always be looking at the

model. We will choose from a whole group of consultants, the best one who can do the job.

MR. SCHROCK: Could I -- just while you're at that point, add just one suggestion. And that is that when code developers get an idea to take a correlation that they find in the literature to use in the code, but they think that they need to make a modification for one reason or another, why don't they give the professional courtesy to the author of tht correlation, to run that by him for comment, if nothing more than comment.

There are so many things that are ill conceived in the existing code that are there because of the ignorance that follows the lack of that professional courtesy. Now, I think that the NRC should adopt a policy of insisting that that kind of feedback be obtained from people whose work is being used.

MR. ELTAWILA: Okay. That's very good.

CHAIRMAN CATTON: In particular if they're still living. (Laughter.) That was meant as a nasty comment, because some of the correlations are pretty old.

MR. ELTAWILA: I don't know what possessed me yesterday to say that there was -- scanning was adequate. I relly, there are statements that you make in life, and you wonder why you made it. This is one of them.

CHAIRMAN CATTON: Okay. (Laughter.)

MR. ELTAWILA: So, that was not intended. That was we, definitely having the scanning sub-group. And one of the meetings is going to be in Santa Barbara. So, hopefully that you might be able to hop on the plane, and come and visit. We'll give all the details --

CHAIRMAN CATTON: I'd be delighted to do that. I need to know the dates.

MR. ELTAWILA: I will give all the details to Paul -- in two weeks.

CHAIRMAN CATTON: Don't make it right on top of the full committee meeting.

MR. ELTAWILA: As a minimum, it's not going to be before the July 17th or 18th.

I'd like to give you -- so, I know that we -- I promise you that we show a systematic way of looking at the data, and evaluating it. And we focused only on the PIRT. And I appreciate that you limited your discussion to the PIRT.

CHAIRMAN CATTON: Sometimes with difficulty.

MR. ELTAWILA: But I would like to tell you about other activities that we are doing right now, so you can schedule some meetings. As I indicated, we have two scanning sub-group meetings. One on the bottom up, and one on the two down. And they are going to be around the middle of Aril. One might be here, and the other one

definitely at Santa Barbara.

DR. ZUBER: Are they scheduling before the tax, or after?

MR. ELTAWILA: After the tax.

CHAIRMAN CATTON: Thanks. That's hopeful.

MR. ELTAWILA: The task group on code development and assessment has not met yet. And we definitely, tomorrow, as a matter of fact, we are all meeting tomorrow to discuss all the items that are raised in this meeting, and we're taking action. And we will forward what needs -- the action item, and who is in charge of it -- in response to some of the comments that -- which in general, they are very favorable comments, or at least positive comments. And we --

So, the INEL will definitely have to go back, and try to develop, look at the PIRT, and look at the model in the code in item five, which models are in the code, which models are not, and provide us we a plan which we will take to the thermal hydraulic subcommittee -- endorse it. Then we'll come to you, and show it to you before we go on with the program.

We -- having a meeting with INEL on April 6th unfortunately is the same day that the subcommittee is having its full meeting. But the purpose of the meeting is for INEL to show us the one inch hold leg break, a

comparison between the three different facilities, and the AP600.

The -- facility and the AP600, using the lab code. It's not vehicle evaluation, like the marine -- (Inaudible.) We have not seen it, and I hope they heard the comments, that this information should be provided on non-dimensional form, so we might, tomorrow, as a result of comments we heard today, we might postpone that meeting. Let them put this information in one-dimensional form, so they can present it to us -- we will be able to present --

I understand that there is interesst in the subcommittee to go and visit the USO facility?

CHAIRMAN CATTON: That is correct.

MR. ELTAWILA: We would like to accommodate that. And maybe at that time when we visit the OSU, we'll present to you this one inch cold leg break, comparison between the plant analysis, and --

CHAIRMAN CATTON: Okay.

DR. WULFF: -- we need the test.

CHAIRMAN CATTON: -- prior to any testing.

MR. ELTAWILA: -- we hope run a test while you are there. And understand -- (Inaudible.) So, we appreaciate your comments. And I hope -- I promised Professor Schrock that we will definitely continue in that

spirit of cooperation. And you will see the result of that.

CHAIRMAN CATTON: Cooperation doesn't mean you necessarily have to agree with us.

MR. ELTAWILA: Oh, no. That's --

CHAIRMAN CATTON: If you don't agree, and you have good --

MR. ELTAWILA: If we have basis, we'll come to you, and say that's our basis. We disagree with you.

CHAIRMAN CATTON: That's right. But it's the cooperation that's important.

MR. HODGES: And I'd like to add, just a little bit to what Farhouk has said. We appreciate the feedback we're getting here. And you know, some of it is words of praise , and those are always welcome. Some of them are constructive comments, and those are also welcome.

I think a lot of the progress that you've seen made over the last several months is due to several factors. One is the fact that we now have data we can work with. But I think it's also due to the fact -- the attention that Farhouk has given to it, and I think DiMarzo and Dave Bessette have made major contributions to our data analysis. And I think can see some of that's continued.

You know, I think there's a lot yet to be done. But due to their efforts, I think we're seeing a lot happen.

CHAIRMAN CATTON: Thank you. Would either one of you like to comment?

MEMBER SEALE: I think -- almost everything has been covered. I guess one thing I would like us to see Mr. Eltawila's comparison with Paul on the outstanding issues from the earlier review of RELAB. And I'll add one other category in on the things to look at, for surprises.

And that is, I think we ought to check check valves and vacuum breakers. With all this cold water running around in this system, I'm worried about surprises, due to shock -- not shock, but pulling a vacuum, because of condensation, and so on -- (Inaudible.)

-- because the valves -- most that stuff is there because of operating considerations, not necessarily safety considerations. We may not be able to get out of jail, once you get into --

CHAIRMAN CATTON: Tom?

MEMBER KRESS: One other item. I think our consultants covered everything very well. But at the start of the meeting, I recall Farhouk raising a flag, asking us if we cold give some input of what might be mandatory if we had to have budget cuts. And I don't

think we touched on that. And the reason is, to answer that question, you have to answer two -- two other questions.

And that is, how good are the codes already? And how good do they have to be? And the question of how good they have to be ties in to establishing their uncertainty, and what is an acceptable level of uncertainty.

And what we haven't seen yet is how the information we're getting out of the tests, and the code assessment and development, will be translated into its actual uncertainty. What is that process going to be? And how will you know when you have it good enough?

I think I know what the answer is. You have -- you have a set of tests, matrices for each test facility. And you'll look where the code doesn't match very well, and where there are phenomena that are missing, or phenomena -- you'll fix those in the code, and eventually the code will give a curve that looks something like what you see on the tests, for the various sets of tests.

And then we'll say, okay, it looks pretty good -- sort of an expert opinion -- but somewhere along the line, one needs to really do a technical assessment of how good these codes have to be in terms of their uncertainty,

and how do we -- how do we develop that uncertainty out of the tests data we have, including the test data that backs up all the models that are in the code. I think that's missing.

CHAIRMAN CATTON: In part, there's a reg guide that tells them how to do it.

MEMBER KRESS: I know.

CHAIRMAN CATTON: I just. (Laughter.) I just thought I'd add that.

I'd like to thank everybody. And I think it's been a very good meeting. And we'll see you on Thursday afternoon, I guess, 1:00 o'clock to 3:00, next week.

Again, thanks everybody.

(Whereupon, the subcommittee meeting was adjourned at 4:38 p.m.)

C E R T I F I C A T E

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

Name of Proceeding: THERMAL HYDRAULIC PHENOMEA
OPEN SESSION

Docket Number: N/A

Place of Proceeding: 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.

Corbett Riner

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