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Thermal Hydraulic Phenomena Subcommittee

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
THERMAL HYDRAULIC PHENOMENA SUBCOMMITTEE

+ + + + +

THURSDAY

DECEMBER 19, 1996

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The subcommittee met at the Nuclear Regulatory  
Commission, Two White Flint North, Room T2B3,  
11545 Rockville Pike, Rockville, Maryland, at 8:00 a.m.,  
Ivan Catton, Chairman, presiding.

PRESENT:

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

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1 ACRS STAFF PRESENT:

2 Paul Boehnert

3

4 ACRS CONSULTANTS PRESENT:

5 Virgil Schrock

6 V.J. Dhir

7 Novak Zuber

8

9 ALSO PRESENT:

10 Larry Hochreiter

11 Alan Levin

12 Moshe Mahlab

13 David Bessette

14 Rolv Hundal

15 Alessandro Alemberti

16 Gene Piplica

17 George Bankoff

18 Bill Huffman

19 Goutam Bagchi

20

21

22

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25

## A-G-E-N-D-A

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

(1:25 p.m.)

(Slide)

MR. LEVIN: This was going to be the last presentation, I guess. Is it still going to be or is Westinghouse going to get back up after this?

CHAIRMAN CATTON: I'm going to have them make a few closing remarks after you.

MR. LEVIN: Okay.

I apologize for the wrong date, but the rest of the information up here is right.

This is going to be a very brief presentation on where we are in the review now and where we're going. We got this report not that long ago. We've gone through an initial review. We provided a lot of comments back to Westinghouse. I think we're at a point now where we can draw some preliminary conclusions and plan on where to proceed.

I would like to recall at the beginning of this Dr. Catton's remarks in his introduction, where he said that we were making these decisions based on technical information, quantitative evaluation, engineering judgment, and common sense. I think that's a good point because I think that common sense does come into play here and you have to make some determinations

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1 about what's important, what to concentrate on, where to  
2 go.

3 The PIRT scaling report is not the be all and  
4 end all of the Westinghouse test program. We've got a  
5 bookshelf full of reports extending over more than five  
6 years worth of testing, scaling, analysis, PIRT  
7 development, and so forth.

8 It's been a process that has been virtually  
9 continuous over that span of time, over more than five  
10 years. And our conclusions, the staff's conclusions, in  
11 this area are not based solely upon what's in the PIRT  
12 scaling report but based on the totality of the review of  
13 the information that's available to us.

14 Before I put this up, I want to jump ahead to  
15 a point on my last slide. And I don't want to show the  
16 rest of the slide. I just want to stick it up here.

17 (Slide)

18 MR. LEVIN: The insights from the confirmatory  
19 test program have played a significant role in the review.  
20 The confirmatory test program -- and I should add here not  
21 just the test program but the confirmatory analyses, PIRT  
22 development, scaling evaluations, and so forth -- have  
23 played a significant role here.

24 The confirmatory data are not considered to be  
25 part of the design certification database. And in terms

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1 of satisfying regulatory requirements for the content of  
2 design certification test program in Part 52, we don't  
3 consider the confirmatory data. Westinghouse's program  
4 has to stand on its own merits.

5 But in terms of drawing conclusions and in  
6 forming our judgments on what Westinghouse's test program  
7 is showing in their analyses and everything else, this  
8 plays a significant role.

9 (Slide)

10 MR. LEVIN: Okay. So where are we? Our  
11 review started in September. We've gotten very valuable  
12 assistance from INEL, primarily in the area of PIRT and  
13 testing, and from Professor Kojasoy on the issue of  
14 scaling, scaling-related aspects of the report.

15 The specific guidance that I provided to the  
16 reviewers to help focus their review consisted of these  
17 eight questions. And they are: Are the PIRTs complete  
18 from a phenomenological point of view and from a ranking  
19 point of view? And have the rankings been adjusted based  
20 on insights from the test program?

21 second, did the test program cover the  
22 important phenomena? And have new phenomena been  
23 addressed? And have the effects of scaling distortions  
24 been adequately addressed? Are the scaling analyses  
25 appropriately performed?

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1           Is the top-down integral scaling methodology  
2 applied properly? Do the scaling analyses support a  
3 conclusion that the test data can be used to validate  
4 computer code for AP600 plant analyses?

5           Are the insights from the test program  
6 appropriately considered in development of analytical  
7 models? And do any major holes still exist in the design  
8 certification database?

9           Now, these are all important. They are all  
10 important issues. But these really are the keys down  
11 here. In fact, I'd point to these two as being the  
12 primary issues. Can the data be used to calibrate the  
13 codes for AP600? And are there any holes there that need  
14 to be filled in by additional testing?

15           If the answer to this is yes, there are still  
16 holes, then obviously something would have to be done to  
17 address those holes in terms of additional testing.

18           (Slide)

19           MR. LEVIN: Our comments from the external  
20 reviewers came in over a space of weeks between about the  
21 middle of October and the beginning of December. Staff  
22 review proceeded in parallel.

23           MEMBER KRESS: Who were these external  
24 reviewers?

25           MR. LEVIN: INEL and Professor Kojasoy, the

1 contractors.

2 MEMBER KRESS: So that's who you meant?

3 MR. LEVIN: Yes, yes.

4 MR. SCHROCK: Who was the first one?

5 MR. LEVIN: INEL.

6 MR. SCHROCK: INEL?

7 MR. LEVIN: Yes. There are a couple of people  
8 at INEL who looked at this?

9 DR. ZUBER: Exactly who?

10 MR. LEVIN: Paul Roth and Paul Bayless. Cliff  
11 Feinman looked at it also.

12 DR. ZUBER: Roth? He was at Creare? Is this  
13 the same Paul Roth?

14 MR. LEVIN: No. Paul Rothe at Creare is  
15 R-O-T-H-E, I think, isn't it, Rothe?

16 MR. SCHROCK: They're different guys.

17 MR. LEVIN: Different guys.

18 The initial comments were provided to  
19 Westinghouse for further discussion. And you have seen  
20 those. It's that letter with 30 or so questions. We  
21 haven't had those discussions yet.

22 Westinghouse just got that letter about a week  
23 to ten days ago. And we are planning to meet with  
24 Westinghouse and discuss these items, those that rise to a  
25 complex enough level that they can't be resolved by

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1 discussion or by information presented at a meeting will  
2 be issued at RAIs.

3 CHAIRMAN CATTON: When do you plan to do this?

4 MR. LEVIN: After the beginning of the year  
5 but not too long afterwards.

6 CHAIRMAN CATTON: January?

7 MR. LEVIN: Yes.

8 MR. HOCHREITER: Yes.

9 MR. LEVIN: We don't have a date yet, do we,  
10 Bill?

11 MR. HUFFMAN: No, we don't. I think we're  
12 planning on setting -- this is Bill Huffman -- the  
13 projects. We're planning on setting up that meeting  
14 immediately after this meeting is adjourned.

15 (Slide)

16 MR. LEVIN: The preliminary results of the  
17 review taken into totality here, the AP600 appear to be  
18 appropriate in terms of phenomena ranking. Summary  
19 ranking was done based on results from the test program  
20 and I think also based on some of the analysis that was  
21 done.

22 This doesn't mean that the AP600 or INEL parts  
23 agree point by point and ranking by ranking. The  
24 differences are not significant in terms of key phenomena  
25 and the ranking tools which is applied to them.

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1 MEMBER KRESS: Is that how you arrive at the  
2 conclusion of appropriateness, --

3 MR. LEVIN: Yes.

4 MEMBER KRESS: -- is to have an independent --

5 MR. LEVIN: Have an independent review, yes.

6 MEMBER KRESS: And they come up relatively  
7 similar?

8 MR. LEVIN: Right. Yes. I think if you have  
9 two independent sets of experts looking at the same system  
10 and coming up with essentially the same set of phenomena  
11 and behaviors and responses and so forth, that's not an  
12 absolute guarantee that you haven't missed something, but  
13 it provides additional assurance.

14 MEMBER KRESS: There doesn't seem to be any  
15 other real way to say a PIRT is appropriate other than  
16 that.

17 MR. LEVIN: All right. Well --

18 MEMBER KRESS: You can sit down.

19 MR. LEVIN: Thank you.

20 MEMBER KRESS: But it is based on an  
21 independent review and the --

22 MR. LEVIN: It's based on an independent  
23 review. And also since we have the ex-post facto look  
24 from the test program and you go back and you say, "Is  
25 there anything that's popped up that's not" --

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1 MEMBER KRESS: Say you've probably missed it  
2 or something.

3 MR. LEVIN: Yes.

4 MEMBER KRESS: Okay. And you haven't seen  
5 anything?

6 MR. LEVIN: That's correct. Well, anything  
7 that has come up has been added to the PIRT and ranked  
8 appropriately and so forth.

9 In general, new and unexpected phenomena have  
10 been handled and distortions have been handled in an  
11 appropriate manner.

12 MEMBER KRESS: That means they've understood  
13 the distortions and determined their implications for  
14 full-scale?

15 MR. LEVIN: Yes. Well, yes. They have an  
16 understanding of how the distortions affect system  
17 response and what impact they're going to have on the  
18 analyses.

19 The overall scaling approach is acceptable.  
20 Now, this doesn't mean it's perfect. And, clearly, you've  
21 seen from the discussion items that we have provided that  
22 there are a number of areas in which we think that some  
23 improvement is appropriate.

24 My own view is that doing the more elaborate  
25 work on the scaling is not going to change the fundamental

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1 insights that have come out from the analysis that's been  
2 done to this point.

3 MEMBER KRESS: You're going to get the same pi  
4 groups?

5 MR. LEVIN: You're going to get basically the  
6 same pi groups? You're going to get basically the same  
7 results in terms of importance.

8 MEMBER KRESS: In terms of importance.

9 MR. LEVIN: And match-ups between the plant  
10 and the test facilities. Don't think that the additional  
11 work is going to have a major impact. It's going to  
12 change some numbers. It may provide a little bit of  
13 additional insight. But it's gotten this far. And it  
14 doesn't look like there's going to be a sea change that's  
15 going to come about by the additional work.

16 On this basis, we believe at this point that  
17 the data are appropriate for use in validating computer  
18 codes for AP600 analysis and, further, that no major holes  
19 have been identified.

20 Now, there are areas in which the quality and  
21 amount of the data are certainly better than others. And  
22 I think the weakness that could generally be agreed upon  
23 here is in the PRHR.

24 In that area particularly, I think we have  
25 some good insights from the ROSA testing because that heat

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1 exchanger looks more prototypic than anything else that is  
2 in any of the test facilities in terms of the design of the  
3 thing and its operating conditions. And you can argue  
4 over the number of tubes in ROSA versus the number of  
5 tubes in AP600 heat exchanger as being prototypic or  
6 showing prototypic behavior.

7 Overall we don't think there are major holes  
8 in the database.

9 DR. DHIR: What about critical heat flux? You  
10 never go to critical heat flux in ROSA.

11 MR. LEVIN: Well, Westinghouse claims that you  
12 never go to critical heat flux in AP600.

13 DR. DHIR: Well, have you accepted it?

14 MR. LEVIN: Well, I think we're still looking  
15 at it, but this looks like to me a design issue as much as  
16 anything else. What we have asked Westinghouse to do --  
17 and we have RAIs out on this. We have some responses back  
18 that we're still taking a look at. Plus, we're just at  
19 the beginning now of reviewing the revised PRHR report.

20 What we have asked Westinghouse to do is  
21 perform some sensitivity analyses assuming basically that  
22 a significant portion of the heat exchanger becomes  
23 deactivated by virtue of CHF and to show what the margin  
24 is.

25 And if they can show they have sufficient

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1 margin assuming that a conservative part of the heat  
2 exchanger is deactivated, then I think that resolves the  
3 design issue.

4 MEMBER KRESS: Do you think water hammer falls  
5 into the category of major holes identified?

6 MR. LEVIN: No, for several reasons. First of  
7 all, the test facilities weren't designed for it. It's  
8 not clear at this point that what's being seen in OSU is  
9 prototypic. I think there's more evaluation that needs to  
10 be done.

11 It's not an area that codes model. We're  
12 talking about the design certification database as being a  
13 basis for evaluation of Westinghouse's computer codes for  
14 AP600 analyses. I don't think that water hammer falls  
15 into that category.

16 I think that it's a design issue. I think  
17 that it's something that Westinghouse needs to address. I  
18 think that the insights from the test program may play a  
19 role in that assessment, but in terms of a more narrow  
20 definition of what the requirements for design  
21 certification testing are, this doesn't fall quite into  
22 that category.

23 I haven't seen anything. I don't claim to be  
24 an expert in water hammer. I'm familiar with the basic  
25 concepts. I've done a little bit of work in the area back

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1 in a previous career.

2 I haven't seen anything that leads me to  
3 believe at this point that there is a significant  
4 challenge to reactor system integrity as a result of water  
5 hammer, certainly not during normal operation and the  
6 sorts of things that we're seeing in OSU are during small  
7 break LOCAs.

8 Now, if there were a way to get steam down a  
9 DVI line so that you could create a water hammer  
10 sufficient to break one of those lines and take out a  
11 safety injection path, that --

12 MEMBER KRESS: That, of course, is --

13 MR. LEVIN: -- would be a problem. But we  
14 haven't seen any evidence of that based on OSU. And I  
15 have a hard time seeing a physical mechanism for it.

16 We need to go back and ask Westinghouse to do  
17 some additional evaluation here. And we'll take a good  
18 close look at it between us and Division of Engineering.  
19 But I don't think there's a whole lot more that could be  
20 gotten out of it by testing per se.

21 MEMBER KRESS: I think I would -- how about  
22 oscillating flow behavior?

23 MR. LEVIN: I think Westinghouse has addressed  
24 that reasonably well in the PIRT scaling report and  
25 discussions we have had, responses to RAIs and so forth.

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1 There may still be some differences between their  
2 interpretation and the Office of Research's. And you can  
3 argue back and forth on who is more right.

4 I think that Westinghouse has provided some  
5 good evidence that these things are basically  
6 self-limiting. And once you uncover the hot leg, the  
7 oscillations basically die.

8 There is enough margin there between the top  
9 and the bottom of the hot leg and the top of the core that  
10 it's difficult to see a mechanism that would get you into  
11 trouble. These things would tend to grow in an  
12 unrestrained manner.

13 The last thing is what I said initially is  
14 that Westinghouse is going to address these discussion  
15 items. We will, of course, reflect on the information  
16 presented here and consider additional issues raised by  
17 ACR and require their resolution as well.

18 But one of the points in this meeting and  
19 moving forward from here was that the Committee wanted to  
20 take a look at the PIRT scaling report first before moving  
21 on to anything else having to do with the testing and the  
22 codes.

23 Well, we're not finished with the PIRT scaling  
24 report yet, but I think that we're far enough along here  
25 where some attention can be brought to bear on the codes

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1 now.

2 The database is established. The database  
3 looks like it's appropriate for validating the computer  
4 codes.

5 MEMBER KRESS: When you say that, are you also  
6 -- can I read into that that the database is appropriate  
7 and sufficient?

8 MR. LEVIN: Yes, yes. The database is  
9 appropriate and sufficient within the context of what the  
10 design certification database is supposed to consist of.  
11 Okay?

12 And, really, where the critical issues are  
13 here, which is moving on from here, is: Are the codes  
14 appropriately designed to do what they need to do? Are  
15 they appropriately validated? Can they deal with what has  
16 been seen in the test facilities? And can you make the  
17 extension from there to plant analyses? That is the next  
18 step.

19 And it looks to me -- it looks to me. It  
20 looks to us -- you know, I'm speaking for the staff in  
21 general, people who have been looking at this besides me  
22 -- that in this area it's not inappropriate to move on to  
23 start looking at the codes while we wrap up the remaining  
24 issues from this report.

25 MR. SCHROCK: Related to that, Alan, I read

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1 somewhere that you are coming to the conclusion that the  
2 lumped capacity version of GOTHIC should serve adequately  
3 for the containment analysis.

4 MR. LEVIN: I am not prepared to address that  
5 at all. I don't do the containment reviews. You'll have  
6 to talk to --

7 MR. SCHROCK: Somebody else?

8 MR. LEVIN: You'll have to talk to somebody  
9 else about that.

10 CHAIRMAN CATTON: That would be Kudrich,  
11 Kudrich.

12 MR. LEVIN: That's Containment Systems Branch.  
13 I want to make it clear that this discussion is limited  
14 strictly to reactor systems-related testing. It draws no  
15 conclusions about containment system testing or analysis.

16 I don't want that to be construed either  
17 positively or negatively. It's a neutral statement.  
18 Okay?

19 MR. SCHROCK: I'm sorry I raised it. I should  
20 have known. I did know, but --

21 MEMBER SEALE: Well, I think it was important  
22 for us to remember that distinction. So it's not  
23 inappropriate.

24 MR. LEVIN: No, no. It's not inappropriate.  
25 But I don't want my comment to be taken in a negative



1 context. It just means that --

2 MEMBER SEALE: Sure, sure. We understand.

3 MR. LEVIN: -- I'm not prepared to address it.

4 All right. What we've got to do. We've got

5 to finish our review of the revised passive RHR report.

6 We have to review responses to outstanding RAIs and

7 discussion items on remaining test programs. And we have

8 to ultimately prepare our final safety evaluation report

9 input somewhere down the line here.

10 CHAIRMAN CATTON: Can you make a guess as to

11 when you're going to do that?

12 MR. LEVIN: Well, I know what our schedule is.

13 (Laughter.)

14 CHAIRMAN CATTON: Okay. If they're unrelated,

15 I --

16 MEMBER SEALE: Where in the sky is that pie?

17 MR. LEVIN: My guess is by sometime during the

18 summer. And more specific than that, I don't want to get.

19 DR. DHIR: Have we got this report on PRHR?

20 MR. LEVIN: You should have it. You get

21 copies of all the WCAPs. ACRS gets copies of them.

22 Westinghouse has to respond to the outstanding

23 RAIs on the OSU and ADS programs, the scaling PIRT

24 discussion items, and any RAIs growing from there and any

25 RAIs developed from the passive RHR report and anything

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1 that comes up from this Committee as well, the  
2 Subcommittee and the full Committee.

3 Just to mention here, I said at the beginning  
4 at my first presentation that the supplemental draft  
5 safety evaluation report, the SDSER, conditionally closed  
6 the reviews of these two test programs. We felt that  
7 Westinghouse had successfully addressed the issues that  
8 have been raised on the test programs in terms of the  
9 data. And we closed them contentional pending the review  
10 of the PIRT scaling report. And we haven't seen anything  
11 grow out of the closure report that would reopen these.

12 And that's all I have.

13 CHAIRMAN CATTON: Thank you, Alan.

14 Any questions for Alan?

15 MR. SCHROCK: Yes. As I understood it,  
16 Westinghouse was seeking closure on the scaling at this  
17 meeting. It's unclear to me precisely what constitutes  
18 closure. And it's also, I guess, unclear to me who does  
19 the closing.

20 I expect that you're looking for a  
21 recommendation from ACRS or a conclusion from ACRS in this  
22 regard, but do I understand that you feel that the scaling  
23 report is conditionally closed?

24 MR. LEVIN: No, no because we still have a  
25 bunch of discussion items out there that need to be

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1 addressed.

2 MR. SCHROCK: Right.

3 MR. LEVIN: And some of them deal directly  
4 with scaling. So clearly the answer is no, but we feel  
5 that things have progressed far enough to allow us to move  
6 in parallel onto other topics where the testing program  
7 and the associated activities, scaling and so forth, play  
8 a role.

9 I wanted to mention one other thing.  
10 Westinghouse in their presentation brought up an issue,  
11 which is that over the course of the years here that they  
12 have addressed some of the issues that have come up in the  
13 scaling program by making design changes in the plant.  
14 And I think it was a very good point.

15 I wanted to bring up one that they didn't  
16 mention, -- and I'm a little surprised -- which is putting  
17 the ADS Stages 1 through 3 on timers after ADS 1  
18 actuation.

19 I think that's a significant design change.  
20 And it was done right before SPES. It was like February  
21 of '94 because I remember they had to make a last minute  
22 change in the SPES program to accommodate that.

23 If you recall when we came to this  
24 Subcommittee on the high-pressure integral testing  
25 program, one of the issues we raised was that everything

1 was scenario-specific because at that point ADS was based  
2 on the rate at which the CMT drained.

3           There was a different actuation level for  
4 every stage of ADS 1 through 3. And you couldn't make any  
5 predictions about the way the system was going to operate,  
6 even after the first stage actuated. You had to look at  
7 each scenario independently.

8           Well, now that ADS 1 through 3 is on timers,  
9 it tends to collapse things down once you get to ADS 1.  
10 Now, there are differences, obviously, in the progression  
11 of events before you get to ADS 1 for small breaks. The  
12 very small, small breaks you get an hour or more of CMT  
13 recirculation and slow system draindown and CMT draindown  
14 until you get to ADS 1 actuation level; whereas, for  
15 two-inch, four-inch breaks, so forth, the progression of  
16 events is much more rapid.

17           But it took away, that one change took away, a  
18 lot of the concerns that we had about scenario dependency  
19 from the beginning until you finally got down to ADS 4.

20           MEMBER KRESS: What sets the zero point on the  
21 timer?

22           MR. LEVIN: It's a S signal. It's ADS Stage  
23 1.

24           MR. HOCHREITER: The timers?

25           MR. LEVIN: Yes, ADS Stage 1.

1 MR. HOCHREITER: ADS Stage 1 is based on CMT  
2 level.

3 MR. LEVIN: ADS 1 is still CMT level. ADS 1  
4 is CMT level. CMT actuation is on an S signal, the  
5 draindown to ADS 1. And then that starts the timers.

6 DR. ZUBER: I'm a little bit confused because  
7 I got different signals from you. I interpret your  
8 comments in two, three ways. You find that we have  
9 sufficient data, and data can be used for code validation.  
10 That's one.

11 Two, scaling is acceptable, but still some  
12 questions are open and that you would like to proceed in  
13 parallel.

14 MR. LEVIN: Yes.

15 DR. ZUBER: Okay. And how are we going to be  
16 informed, first, of your discussions to close these  
17 issues, whatever you may have and which may come from this  
18 meeting as far as this document is concerned and as far as  
19 what is acceptable as the data?

20 See, the thing is I have no problems if  
21 somebody wants to do something in parallel. And then  
22 later on if he has to repeat something, it's a problem.

23 Parallel approach is fine. The problem is if  
24 you do something in parallel and then you find  
25 deficiencies, what are the remedies that you can really

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1 come back and do it over again?

2 See, the thing is -- well, I don't --

3 MR. LEVIN: The point is that, while I think  
4 there are still some things that need to be cleaned up, I  
5 don't think there are fundamental deficiencies that are  
6 waiting to be uncovered here.

7 As I said, that's not based strictly on the  
8 review of this report. That's based on the totality of  
9 the test program review and insights from the confirmatory  
10 program extending over the last six years.

11 I think that in terms of getting everything  
12 down appropriately on paper so that the story is clear,  
13 consistent, understandable, and reviewable and stands by  
14 itself, there's still some work that needs to be done to  
15 get this report together.

16 I would assume that the Subcommittee will ask  
17 Westinghouse and the staff to come back, as appropriate,  
18 when this work is completed to present the finished  
19 product.

20 If I didn't think that the fundamental  
21 conclusions that we have come to at this point weren't  
22 going to change, I wouldn't make the recommendation that I  
23 did.

24 Most of the information that's in the scaling  
25 of PIRT closure report with the exception of the

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1 application of Dr. Wulff's methodology exists in other  
2 places and has been pulled together. I think one of the  
3 weaknesses of the report that has been pointed out is that  
4 to some extent, those disparate sources haven't been  
5 reconciled against one another, that it shows sort of the  
6 various origination of a lot of the information without  
7 being put into necessarily a completely consistent  
8 context.

9 It does exist elsewhere, and it has been  
10 reviewed once already in the context of where it exists.

11 DR. ZUBER: Am I correct if I say that this  
12 report was reviewed by INEL and Kojasoy, this report right  
13 here?

14 MR. LEVIN: Yes, yes.

15 DR. ZUBER: And is anything in writing  
16 available?

17 MR. LEVIN: Yes, the letter that we sent to  
18 Westinghouse.

19 MR. LEVIN: That's all?

20 MR. LEVIN: Well, the reports that I have from  
21 the contractors are no more than the list of questions,  
22 really, that I have provided to Westinghouse. I mean, I  
23 filtered them to some extent but not much.

24 MR. SCHROCK: There are line to line  
25 corrections on some pages supplied to us. Is that a

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1 composite of both the INEL review as well as Kojasoy's or  
2 is it only --

3 MR. LEVIN: Yes.

4 MR. SCHROCK: It is?

5 MR. LEVIN: Yes.

6 MR. SCHROCK: Composite?

7 MR. LEVIN: Both, both.

8 MR. SCHROCK: There are significant omissions  
9 in those two, I think. Are there additional errors in  
10 equations and statements about equations beyond those that  
11 are identified so far?

12 MR. HOCHREITER: We have submitted to the  
13 staff a list of errata that we found in the equations. If  
14 there are additional ones that you may have found, we may  
15 have already found them. But if you think there are  
16 additional ones, then --

17 MR. SCHROCK: Well, the only errata I have is  
18 those pages that were sent to us which you're identifying  
19 as a composite of INEL and Kojasoy, not Westinghouse. Is  
20 that right?

21 MR. LEVIN: No, no, no, no.

22 MR. HOCHREITER: Did you send them our stuff?

23 DR. BOEHNERT: Yes. That's what they got.

24 MR. HOCHREITER: Our stuff?

25 DR. BOEHNERT: The ones that I think you made.

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1 MR. LEVIN: The ones that you sent in, the --

2 DR. BOEHNERT: Yes.

3 MR. HOCHREITER: All right.

4 MR. LEVIN: Yes, that was based on  
5 Westinghouse's own work plus errors identified by the  
6 staff review.

7 MR. HOCHREITER: We will be going back through  
8 that in a lot more detail. I mean, some of the comments  
9 that we got from INEL in the staff's letter is basically a  
10 "Go check your equation."

11 MR. SCHROCK: Well, more than that, proofread  
12 the thing before you send it out next time.

13 MR. HOCHREITER: Well, yes. Well, we thought  
14 we did that, but apparently --

15 CHAIRMAN CATTON: Spell my name right.

16 MR. HOCHREITER: That was a test. I told you  
17 that was a test.

18 MR. SCHROCK: I'm only wondering if the  
19 process of iteration is going to converge on a  
20 satisfactory product with only one iteration if the  
21 identification of things to be fixed is limited to what we  
22 received so far. I think there are still problems that --

23 MR. HOCHREITER: I don't interpret what Alan  
24 said to be that case. What I interpret Alan said or what  
25 he said was that we have to go back, look at the report,

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1 address the issues that have been raised by the staff.

2 And there are like over 30 of them.

3 I don't know. We've heard issues from the  
4 Subcommittee. We have to look at those issues. And in  
5 many cases, they're very similar to what the staff has  
6 raised.

7 And we certainly owe the staff a correct  
8 report. And we'll be iterating with the staff on that.  
9 And if other issues develop, we will simply have to try to  
10 address them.

11 MR. SCHROCK: I think given the fact that we  
12 were talking in terms of, quote, "closure" today means  
13 that we ought to be seeking closure with one additional  
14 iteration. And I'm not convinced that that will happen as  
15 things stand.

16 MR. LEVIN: I think maybe it's up to  
17 Westinghouse to provide correct information and to us to  
18 review it and in my own view not come back to the  
19 Subcommittee until we're satisfied that things can be  
20 closed in one additional iteration.

21 I don't think we want to be coming back here  
22 again and again and again. I know Westinghouse doesn't.  
23 And the staff doesn't either.

24 DR. ZUBER: Would you require or ask or do you  
25 find it necessary to revise this report? And to what

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1 extent?

2 MR. LEVIN: Well, we have already asked --  
3 Westinghouse has already taken the action to try to  
4 correct the errors. Obviously that's one thing that needs  
5 to be done.

6 DR. ZUBER: It's not the --

7 MR. LEVIN: Wait a minute. And where specific  
8 things need to be reflected in the report and it would not  
9 be necessarily appropriately handled in just an RAI  
10 response, I think we would ask them to go back and revise  
11 the report.

12 There may be issues that are raised where  
13 additional require that sort of thing where an RAI  
14 response is the way to handle it. And if those responses  
15 need to be put in an appendix to the report or something  
16 like that, that's something we can discuss with  
17 Westinghouse.

18 DR. ZUBER: Let me jump the gun because I need  
19 to make a comment, but I should elaborate. I think this  
20 report is a disservice to the technology. I think it's a  
21 noise, it's a hodgepodge put together you cannot go  
22 through and, actually, very inimical to this industry.

23 I would love to go through this report with  
24 the press and go public with it. It is really a  
25 disservice to the technology and also to Westinghouse.

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1 But you are not a technical company. Now you are a media  
2 company. Maybe you're not interested in this.

3 But this technology will stay and should stay  
4 for the benefit of this country. I'm quite serious. I  
5 think --

6 MR. HOCHREITER: Message received.

7 DR. ZUBER: I think what you have, many of  
8 these questions which were brought over a period of two,  
9 three years you unfortunately somehow didn't listen to or  
10 didn't want to listen. Maybe my foreign accent was too  
11 heavy, whatever the case may be.

12 You started to work on this very seriously  
13 since May or June. And this was obvious in this  
14 presentation. And this is reflected in this report. It's  
15 not a complete thing.

16 I don't think that any technical man, a  
17 reasonable technical man, with an open mind to this  
18 industry -- and I have an open mind; I grew up in this  
19 industry if you want -- who can really accept this, that  
20 we can go to the public and defend what we are doing.

21 MR. LEVIN: Well, yes. Look, I don't --

22 DR. ZUBER: Actually, I would like to actually  
23 elaborate why, but the point is if I am going to add only  
24 a few corrections to some equation in one appendix and  
25 then use this to say this is the basis, I can certify this

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1 reactor, we are on a weak, weak ground.

2 MR. LEVIN: Well, I'll tell you how I look at  
3 things. And you can take it for what you will. Maybe I'm  
4 too close to the issue, too. Larry told you before that  
5 Westinghouse tends to sort of write these reports for  
6 themselves. And if that's true, obviously that's a  
7 deficiency in the process of Westinghouse that they need  
8 to address one way or the other.

9 But I have been looking at this for six years,  
10 too. And I have been immersed in it over that period of  
11 time. I have done up until the middle of this year very  
12 little else except design certification test programs for  
13 the NRC. And I get this report.

14 I don't look at this as being the one report  
15 on which Westinghouse's test program needs to be judged,  
16 make or break. It is supposed to be a pulling together of  
17 critical information developed over the six years of the  
18 test program and all of the activities associated with it.

19 But there's no way that you can begin to pull  
20 everything into one even relatively consistent compendium  
21 that can begin to reflect the amount of effort that's been  
22 spent on the part of Westinghouse or the staff.

23 DR. ZUBER: Okay.

24 MR. LEVIN: Okay? And so, I mean, when I read  
25 this report, if there's something that I come to that's

1 missing, I go up on my bookshelf, and I pull out the OSU  
2 test analysis report or the SPES data record or something  
3 like that. And I look it up. And I say, "Oh, yes. Well,  
4 I see what they're talking about."

5           Somebody coming at it from where you're coming  
6 at it would tend to say, "I don't have this other report  
7 in front of me. It's hard to make the reference and see  
8 what's being done."

9           So yes, I understand your comments. And to  
10 some degree I agree with them, but I don't judge this  
11 report as being the sole basis on which Westinghouse's  
12 test program needs to live or die.

13           DR. ZUBER: Okay. Really, I'm going beyond  
14 this point. I'm taking this report. If this is going to  
15 be yours to say, "We have enough data. The facilities are  
16 scaled. And I can use this facility to verify the code"  
17 and you go with this to public," you will have  
18 difficulties.

19           And I said I would love to be inimical to this  
20 industry and make my comments based on information here.

21           CHAIRMAN CATTON: The problem is, Alan, that  
22 judgments are reached and the answers are somewhere else  
23 and there's no reference. That's just not good  
24 engineering practice.

25           MR. LEVIN: I agree.

1 DR. ZUBER: But one more thing, scaling, the  
2 simplest thing. What really surprised me yesterday --  
3 there were pleasant surprises, and I will bring them up.  
4 But let me say what really is a negative thing.

5 When we came up to this natural circulation to  
6 a single phase flow, something which we know how to do it  
7 and it was not many, there were discrepancies here. And  
8 we were not able to explain them.

9 If I am not able to explain single phase,  
10 natural circulation, scaling, how can I then expect things  
11 which are much more difficult? And the guy who doesn't  
12 have to be an expert can pick on this and say, "You didn't  
13 scale this. What about that?" We are in a sad and  
14 difficult position.

15 I said I would love to say this is enough and  
16 be happy. But if you ask me for my own professional  
17 think, I think it is not sufficient. Actually, it's  
18 incomplete.

19 CHAIRMAN CATTON: I'm going to have to end  
20 this at this point because what I want to do is I want to  
21 get more complete reports from each of the consultants.  
22 And I also want to hear if Westinghouse has any closing  
23 comments. So I'd like to move on. Anyway, thank you,  
24 Alan.

25 MR. LEVIN: Yes.

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1 CHAIRMAN CATTON: I think what I will do is  
2 give Westinghouse 15 minutes.

3 MR. HOCHREITER: I don't need that.

4 CHAIRMAN CATTON: Five?

5 MR. HOCHREITER: Maybe one. In the report  
6 that we gave you, you have to remember the context in  
7 which the report was developed. The report was initially  
8 developed at the request of NRR or NRC to be a closure  
9 document on the program, which was to basically be a  
10 compendium of what had happened during the program, the  
11 different tests, the interrelationships between the tests,  
12 and the information that was developed such that you had  
13 in one place and one document the pertinent information on  
14 all the test programs. And this is what would then  
15 provide the basis for the code validation.

16 When we came to the Subcommittee meeting in  
17 May, we got, as far as I'm concerned, a major redirection  
18 in the scaling and the desirability of the Committee and I  
19 would have to say of the staff also to look in more detail  
20 at the system-wide scaling analysis that had been recently  
21 published by Dr. Wulff. And so we attempted to do that.

22 Now, did we do it well enough? Well, that's  
23 always in the eyes of the beholder. But at least we tried  
24 to take a crack at it. The comments that we got yesterday  
25 when we went through the review we're going to go back and

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1 take seriously and try to clean that up and put that in a  
2 better form, better shape such that it is more defensible.

3 But, as Alan said, this report is just the  
4 report that sits on a stack of other reports that probably  
5 go up to the ceiling in this room and maybe more than one  
6 pile that really denotes all of the history, the design,  
7 the database, the analysis of the test data that we think  
8 is adequate now to proceed on code validation.

9 We recognize that we have outstanding issues  
10 on this report. The staff has made that very clear to us  
11 in the letter which has at least 30 items that we have got  
12 to resolve with them plus the information that we received  
13 at the meeting here.

14 So we are going to proceed to do that.  
15 However, we think it's time that we move on to the codes.  
16 We can do these things in parallel. And, as was said  
17 earlier, we do this obviously at our own risk.

18 But we need to get the Subcommittee to look at  
19 the codes, too, because I think you have to look at how we  
20 use the data and what we want to do with the data.

21 So all we're saying is we think we have  
22 sufficient information. We can certainly package it  
23 better, make it appear better, certainly write it better,  
24 make it clearer. Okay? But we think we have to move on  
25 to the codes because you're going to have to see what

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1 we're doing with the information that we have generated  
2 and how we're using it with the codes. That's very  
3 important to us. And we need your input, which I'm sure  
4 we will get, on that.

5 So thank you.

6 CHAIRMAN CATTON: Thanks, Larry.

7 Start with Virgil here at the end.

8 DR. ZUBER: I thought you would go  
9 alphabetically.

10 CHAIRMAN CATTON: I was just going to work  
11 this way.

12 MR. SCHROCK: Well, I think I'll be fairly  
13 brief.

14 CHAIRMAN CATTON: I also would like a written  
15 report.

16 MR. SCHROCK: Yes. Oh, definitely a report.

17 CHAIRMAN CATTON: By maybe the first week of  
18 January?

19 MR. SCHROCK: Yes.

20 CHAIRMAN CATTON: That gives you plenty of  
21 time to procrastinate.

22 MR. SCHROCK: Maybe too long.

23 CHAIRMAN CATTON: I'll accept it sooner. And  
24 you can fax it to me.

25 MR. SCHROCK: Well, we came with the idea that

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1 there was to be a decision on closure. And the closure  
2 decision seems to be fuzzy and somewhat deferred. I'm  
3 still not clear exactly on what closure means here, but  
4 maybe that's not important.

5 With respect to the technical content of what  
6 was reviewed in this meeting, I guess my general view that  
7 I've had for some time now that the Westinghouse test and  
8 analysis program is quite extensive and very likely  
9 sufficient hasn't changed.

10 I have not received information in this  
11 meeting that gives me any stronger conviction than I had  
12 before I came here that that is the case. And I think  
13 that's very unfortunate. I think I should have gotten  
14 something here that made me think that I'm more  
15 knowledgeable now about why this is an okay program than I  
16 had before I came, but I don't.

17 A major problem in my mind is the fact that  
18 the scaling is poorly put together, poorly described.  
19 It's applied in a way which makes it very hard to  
20 interpret. The basic concept is so simple you begin with  
21 conservation equations. You non-dimensionalize those  
22 conservation equations.

23 And you ferret out what you think is the most  
24 important term there and divide through, then, by the  
25 coefficient on the most important term and proceed from

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1 there, thinking that now you're going to have parameters  
2 which are less than unity and you discover that you've got  
3 parameters that range to numbers very much larger than  
4 unity. And somehow this isn't a major red flag. To me  
5 it's incomprehensible that that is not a major red flag.

6 So how does one explain the existence of the  
7 numbers that have been reviewed here? In some instances,  
8 questions were asked and we did, in fact, hear  
9 Westinghouse representatives say, "I don't know."

10 That was subsequently denied. And I guess one  
11 would have to go through all of these transcripts to find  
12 out whose memory is correct and whose memory is incorrect.

13 I'm not sure that that would be productive,  
14 but it does seem to me that we haven't converged at all on  
15 a meeting of minds about what we even heard here and on  
16 what to interpret from these results.

17 The Westinghouse people say, "We've done the  
18 scaling. The scaling shows that our systems are  
19 well-scaled and the data are adequate for their purpose."

20 I look at them. I don't see that that's  
21 shown. I hear my colleagues here saying that they have  
22 looked at them, they don't see that as so. And the rest  
23 of it is all noise. I mean, we talk about how to present  
24 it. We're simply not converging on something at any kind  
25 of a rate that I see as getting to a success point at any

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1 time in the near future.

2 So I don't know how the scaling report can get  
3 fixed up in one iteration. Chapter 3 is kind of the guts  
4 of the scaling analysis. It needs a total rewrite with  
5 considerable care on making it understandable.

6 The sections that deal with the display of the  
7 application of the pi groups coming out of it and  
8 demonstration that the data are okay for and sufficient  
9 for the purposes need to be totally rethought so that it  
10 would make sense to A, B, C, or D professional engineers  
11 and hopefully many others that are going to have to look  
12 at it in the future.

13 As it stands, I don't see how a reasonable  
14 person can agree that that evidence exists in this report.  
15 Alan has told us that the staff conclusion is based on  
16 much more information than is in this report. And I know  
17 that's got to be the case. But it must be an enormous  
18 amount of solid information beyond what's here in order to  
19 reach the conclusion that, yes, it's okay.

20 So I'm really unable to offer any positive  
21 advice that the ACRS should say that the scaling  
22 considerations and the determination that the data are  
23 adequate for testing the codes is ready to be blessed. I  
24 cannot make that recommendation.

25 CHAIRMAN CATTON: Novak?

1 DR. ZUBER: I agree 110 percent with Virgil.  
2 I'm sad to say that. Unless I want to compromise my  
3 integrity, technically and whatever, morally, I cannot  
4 really make a statement that I have seen in this report or  
5 heard at this meeting that we have sufficient data and the  
6 data are useful for qualifying the code.

7 I would like -- yes?

8 CHAIRMAN CATTON: I just want to pose a  
9 question. From what we heard, from what Alan said and  
10 also from what Larry said, what they would like to do is  
11 to go in parallel. I would like your view on, first,  
12 aside from all of the documentation, what is your  
13 engineering judgment and then --

14 DR. ZUBER: Okay. Let me --

15 CHAIRMAN CATTON: I want to split the two.

16 DR. ZUBER: Oh, no, no, no. Let me say I have  
17 no problem if somebody wants to go in parallel provided  
18 that everyone concerned realizes there may be some penalty  
19 two months from now or six months from now.

20 I think parallel is fine, but if something is  
21 incomplete, something is unsatisfactory, then it should be  
22 made completely clearly, "By God, you either do it or you  
23 don't get what you want."

24 We cannot saying, "I believe something is  
25 relatively okay." You get an approval which is not

1 relative. It means go ahead.

2 CHAIRMAN CATTON: That's right. That's what  
3 certification means.

4 DR. ZUBER: I think this is the final thing.  
5 If you want to go in parallel, fine. But down the road  
6 you have to realize you may have to redo it.

7 Okay. Now, let me, then, divide my comments  
8 in three parts: one, concerning this report; second, what  
9 I heard at this meeting; and, third, some of my  
10 recommendations. Maybe they could be helpful.

11 I have made the recommendations many times in  
12 the past and viewed my opinions, but this translating is  
13 that after four years, I hear again, "I didn't know. I  
14 was not told."

15 These bathtub problems and concerning these  
16 oscillations, I brought up in 1992. And, actually, I was  
17 very critical of RES and of INEL scaling because they  
18 didn't consider this. And this is public document. So  
19 this is not a new issue. It was with us three years or  
20 maybe even four years.

21 So if Westinghouse in their wisdom decided not  
22 to do it or address this problem, that's not my problem.  
23 I have to make a judgment if this is good enough or not.

24 Now, the report, as Virgil said, is  
25 incomprehensible. An engineering approach has an overall

1 strategy, an overall team, and an overall design. This is  
2 not reflected in this report. It's a hodgepodge of things  
3 done in '88, put together in order to satisfy ACRS or  
4 probably these old fuddy duddies here. I have heard this  
5 expression also made with respect to this group.

6           There is no synthesis. As I said,  
7 sarcastically it reminds me of the communist approach. We  
8 don't pay you. We don't -- I mean, I pretend to pay you.  
9 I pretend to do work. This report, as I said, pretends to  
10 provide information to close an issue.

11           This is not -- there is no signal in this  
12 report. It's almost like a Brownian motion. It's noise.  
13 I cannot find things. Something is either in there or  
14 missing or just explained with arm waving.

15           This technology has to have a solid ground to  
16 defend it to the public or if you want to sell it to the  
17 Chinese, we have to have something which is technically  
18 solid. It is not in this report.

19           This report when I was reading it reminded me  
20 of the sumo approach. You do it by weight.

21           CHAIRMAN CATTON: I have a certain empathy.

22           DR. ZUBER: You know, it is providing enough  
23 information you can always refer. It's in the report. I  
24 don't know where. I cannot find it, and I cannot spend my  
25 time to do it. I cannot charge ACRS to say, "Look. On

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1 Page so and so is this information." A report should not  
2 be a sumo approach. It should be information. And this  
3 is a synthesis. And it's not available here.

4 As far as scaling, it's incomplete. It is  
5 obvious that it was done, an effort was done, after May or  
6 June. And this became really obvious here because,  
7 actually, my colleagues were asking, "Look at this group.  
8 This is identical to this group and that group." What it  
9 means is this was put together without really much  
10 thinking.

11 And I wish I could say I sympathize with you,  
12 but this was brought several years ago. It was not done.  
13 Now we have to pass a judgment. Is this acceptable and  
14 sufficient? In my judgment it is not. And in my  
15 recommendation, I could make an honest recommendation to  
16 this Committee to proceed.

17 An explanation. When we ask something, it's  
18 in this report. Larry could not even say where in the  
19 report. We did not get the number.

20 We have these overlapping groups, which really  
21 could be compacted in simpler ones and have a nicer  
22 presentation.

23 Third thing, computing the pi groups. That  
24 was different. How did you do it? Well, it was done this  
25 way, that way. There's nothing in writing I can really

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1 look and say, "This is good." We have done this way, that  
2 way.

3 We could not really get this information about  
4 the pi group. And, really, to me it was really  
5 devastating, if I may say, that, even when you have  
6 discrepancy in natural circulation single phase flow, we  
7 could not obtain a satisfactory answer.

8 Now, if I have to say this is a satisfactory  
9 report and grant to you this in writing and say this and  
10 somebody challenges me two, three years, "How could you  
11 write this letter?" I would have to compromise either my  
12 integrity or my technical judgment. And I'm not ready to  
13 do that.

14 Question of selecting time. This was left  
15 open. I mean, we had the things all over the place. And  
16 they said, "This is satisfactory. This is relatively  
17 good." But they are seeking not a relatively approval,  
18 the definite approval. And very often we are saying we  
19 don't understand it.

20 Now, I sympathize with the predicament of the  
21 stuff that they are faced with the pressure from industry.  
22 This report with the sumo approach would say, "We have  
23 done the work. Here it is. The stuff is not responsive  
24 to us. ACRS is nitpicking. We have enough information."

25 And I sympathize with the difficulty that each

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1 member of the staff would think how to react under this  
2 pressure. I am not under this pressure. I am giving you  
3 my technical judgments.

4 I also, if I may say so, if I am not as  
5 presumptuous, sympathize with the group of the ACRS. I  
6 don't have to write this letter. If I had to write this  
7 letter, it would be just what I'm saying. You will have  
8 to write it. And you will have then to defend it if you  
9 are challenged.

10 To me how ACRS, how NRC, the staff responds to  
11 work like this and this procedure really will be a  
12 transfer function on the future of this technology. The  
13 question is: Should we get approval to make this sale?  
14 Can we have this approval so somebody else will buy our  
15 company? Is it relevant to this question? Is this  
16 technology good for our country? I don't see that one can  
17 make this judgment on this report.

18 This is all the information we have. This is  
19 all the information somebody outside has to judge this  
20 industry. Outside people don't have the information I  
21 have, let alone what they have. When they read this  
22 report, this will be the question.

23 Okay. Now maybe some positive comments. I  
24 was pleasantly surprised. There were pleasant things at  
25 this meeting. I was pleasantly surprised that

1 Westinghouse reacted to our comments and wanted to address  
2 the scaling.

3 I was also pleasantly impressed that  
4 Westinghouse looked at this approach with a matrix and  
5 looked at this bathtub problem. It's not finished, but  
6 you are on the correct path. And I think this could be a  
7 way to address this thing and put it in a better form. I  
8 think what you did as the first step in this matrix  
9 approach is very positive. And I would encourage you to  
10 do it.

11 If you want, what you have really to look in  
12 the future is when you rewrite this report, I second what  
13 Virgil said, that you have to correct Section 3. I would  
14 really look how you normalize that group and have a good  
15 discussion on it, how you select your time, whether you do  
16 something like George, you take an average.

17 But we don't have this computation. Code has  
18 number one hand calculation, something else. They are  
19 really all over the place. Somebody can jump on us when  
20 you have results like this. You have to select a  
21 consistent approach to evaluate that time and have a  
22 consistent approach to add to the report. You cannot  
23 select one way here and other way here and say we have the  
24 story. There should be consistency.

25 You have to bring together also how you

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1 address the distortion. What you have also to bring  
2 together is -- and you have attempted; it's not really  
3 complete, but it's a first step maybe -- the way you  
4 wanted to have the PIRT related to scaling and how it was  
5 addressed.

6 In those tables, Larry, you had, what you can  
7 do now is when you have the reference, add to the page and  
8 the equation so when somebody gets this, he can go through  
9 it and find it and say, "Aha. This is good enough."

10 If you don't do that, then you say my reaction  
11 is I want really to augment all the information. So I  
12 cannot make a judgment. And then the judgment will be  
13 negative.

14 I don't have the report by Bouÿre. I have his  
15 report in French. If I find it home tonight -- I'm  
16 leaving tomorrow; so I won't be here until January 9th --  
17 I shall bring to Paul that report --

18 MR. HOCHREITER: Okay.

19 DR. ZUBER: -- so he can mail it to you and  
20 you can use it.

21 CHAIRMAN CATTON: You can read French, can't  
22 you, Larry?

23 MR. HOCHREITER: Parl  z-vous?

24 MEMBER SEALE: Certainment.

25 DR. ZUBER: I wanted to if I don't find it --

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1 do we have a transparency?

2 DR. BOEHNERT: Yes.

3 DR. ZUBER: Do you have a pencil? I'm not  
4 saying that you should really do it. Think about it. If  
5 I have -- and this is some other components here. And  
6 this can be other heat sink or heat source. And it looks  
7 like this. And I look at this, I can continue two cases:  
8 single phase and two-phase.

9 In single phase, I will have a  $D$  rho is equal  
10 to  $D$  rho,  $DT$  plus  $D$  rho,  $DP$ ,  $DP$ . And I shall have also  
11 for  $DH$  is equal to  $DH$ ,  $DT$ ,  $DT$  plus  $DH$ ,  $DT$ ,  $DP$ ,  $DP$ .

12 Okay. If I say that in some consistent -- and  
13 this is small with respect to this case. And you can make  
14 them for acoustic --

15 DR. BOEHNERT: You need the mike up, Novak.

16 DR. ZUBER: -- approximations, you can neglect  
17 these things here, this. So you deal with these two  
18 terms. You use these two equations. And you put it in  
19 the mass conservation and this in the energy conservation  
20 equation.

21 From these two, you get the velocity and the  
22 density. This is what it means to decouple the momentum  
23 from the energy and mass. If you do this, that's a very  
24 simple thing. You can then feed it. You feed this  
25 information in the momentum conservation, and you get the

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1  $\Delta P$ 's. And you get this  $\Delta P$  from here to here. Then you  
2 use the Kirkov model of the matrix formulation, and you do  
3 it. What you really reduce, you reduce your system. This  
4 can be done in one day or in two days.

5 Now, for two-phase flow, you do the same  
6 thing. You have one over  $\rho$ . And it's equal to one  
7 minus  $X$  over  $\rho_L$  plus  $X$  over  $\rho_G$ . And, therefore, you  
8 have minus  $D \rho M^2$  is equal to  $\Delta \rho_L G$ ,  $\rho_L$ ,  $\rho_G$ ,  $DX$ .

9 What you're really saying is at constant  
10 pressure if you are in two-phase flow, at constant  
11 pressure, the properties are constant. So the density  
12 only depends on the quality.

13 You have the same thing for  $DH$  of the mixture  
14 is equal to  $\Delta H_{FG}$  times  $DX$ . You feed these two equations.  
15 This is again the momentum energy. You feed it into the  
16 mass conservation and energy conservation. You get the  
17 density and velocity of the mixture. You put it into the  
18 momentum equation, and you get the  $\Delta P$ 's.

19 You did not achieve what Ivan was saying  
20 yesterday, that you can then reduce everything in terms of  
21 the power. It is the power that is driving it.

22 MR. HOCHREITER: Right.

23 DR. ZUBER: And you get your initial  
24 conditions. You can get everything. All of these groups,  
25 you have only few groups to worry about. And if you can



1 show that these groups are okay, everybody is happy.

2 Now, as I said, this can be done in a day or  
3 so. If I find the French report, I shall bring it to  
4 Paul. It can be done. You can have a defensive document.  
5 You can have a very do-good document. You can be proud  
6 and sell it to the foreigners or in this country. And  
7 then we can defend you.

8 But based on the information I have, I am sad  
9 to say I agree with Virgil. I would not recommend that  
10 this shows that we have sufficient data, the data are  
11 scalable, and I can use it for code applications. I  
12 cannot do that. On the other hand, a parallel approach  
13 can be done.

14 I'm sorry if I used your time, but --

15 CHAIRMAN CATTON: It's all right. It's all  
16 right. I just want to make sure V. J. has a chance.

17 DR. DHIR: He's a hard act to follow. I'll be  
18 brief. I have comments very similar to what Virgil and  
19 Novak have said. I think this meeting was somewhat  
20 premature. And Westinghouse did not have time to absorb  
21 what they had done, and the report leaves several things  
22 that are desired.

23 While doing single loop scaling analysis, I  
24 think we found there were several redundant dimensionless  
25 groups. Anybody who knows about forming dimensionless

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1 groups knows that they should be dependent. And  
2 Westinghouse should have looked at that and then  
3 identified what really were the independent groups.

4 So I would suggest that Westinghouse revisit  
5 the scaling analysis and also take a second look as to how  
6 they evaluated those scaling groups, how the mass flow  
7 rate was used, for example.

8 It was somewhat a pleasant surprise to see  
9 that Westinghouse had made some progress in analyzing loop  
10 to loop interactions, but the work is not complete. I  
11 think Westinghouse should continue to complete that work.

12 In scaling OSU and SPES data to full-scale, I  
13 think we saw existence of distortions. The impression I  
14 get is that Westinghouse does not or cannot explain those  
15 distortions as yet. And I think more work needs to be  
16 done to understand what those distortions mean and how one  
17 would account for those when scaling the data to  
18 full-scale.

19 In my mind, issues with respect to PRHR,  
20 scaling, heat transfer inside the PRHR tubes and heat  
21 transfer in the pool are still open issues. They're not  
22 resolved.

23 The possibility of existence of water hammer  
24 in the vessel, in cold leg and DVI, I think should be  
25 explored more.

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1           Lastly, we did not get much opportunity to  
2 listen to Westinghouse's presentation on oscillations that  
3 occur during long-term cooling. Again, as far as I am  
4 concerned, I think there is still an open issue with  
5 respect to what causes these oscillations and what the  
6 consequences of those oscillations would be in long-term  
7 cooling. I would like have a report if there is a  
8 separate report on that.

9           That's mine.

10          CHAIRMAN CATTON: Thank you.

11          George, do you have a couple of comments you  
12 would like to make?

13          MR. BARKOFF: Yes. I'll be very short.

14          CHAIRMAN CATTON: Good. The clock is ticking.

15          MR. BARKOFF: Yes. I want to thank you and  
16 the Committee for allowing me to sit in on this. For the  
17 audience, I am the Chairman of the Accident Analysis  
18 Subcommittee of Nuclear Safety Research Regulatory  
19 Committee. I am charged with reporting back to the  
20 Committee so that we can become more familiar with what  
21 goes on here.

22                 I was pleased to be able to make some  
23 comments. I had originally intended not to make any at  
24 all. I want to commend what I consider to be an excellent  
25 give and take, both on the part of the Committee and the

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1 way Westinghouse responded. They handled themselves well.

2 I don't see myself so concerned as some of the  
3 Committee members on adequacy because what's clear is that  
4 they're absolutely correct in that it's impossible to  
5 verify based upon the road map that was given. You have  
6 to come back, I would say, within a month and give a  
7 complete story as to where everything can be found, that  
8 you're now just simply saying that it's there.

9 I made a lot of comments yesterday on scaling.  
10 And I have my own opinions. But I think you ought to look  
11 at the physics. I don't see anything in Wolfgang's  
12 approach which prevents the kind of thing that would  
13 happen where we have pi groups which are of the order of  
14 2,000. That is clearly a matter of how you scale it and  
15 what the choice of scales is.

16 And you must always remember that what you're  
17 doing is you're balancing terms in fundamental momentum  
18 equations. You know always that the buoyancy is a  
19 dominant force. So its coefficient will be an order of  
20 one. In fact, you make it an order of one.

21 But your other scaling has to be clearly  
22 looked at for every component, every component separately,  
23 so that it never can be much more than one. There's no  
24 way to balance these two if the pi for that thing is of  
25 the order of ten. It's no longer balancing.

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1 CHAIRMAN CATTON: How about 3,000?

2 MR. BARKOFF: Well, that makes it ridiculous  
3 at that point. So what you have to do in that case is go  
4 back and relook at the scaling and try to find the proper  
5 scaling so that those dimensionless groups which it  
6 multiplies are of order one because you know in the  
7 dimensional codes, in the dimensional calculations, hand  
8 done, that you don't get this great disparity, that they  
9 do balance. Otherwise, you wouldn't have an equation  
10 equal to zero in the right-hand side.

11 So that's an absolute necessity that you go  
12 back and if you've got that kind of thing, you don't do  
13 anything else until you find the proper scaling, then to  
14 find the effect of distortions and all of these other  
15 things once you've got the proper scaling, then you can  
16 make some sense out of it.

17 And then I do mention again the thing that I  
18 talked about yesterday, which is an interesting thing to  
19 do and is not very hard, which is to find the fundamental  
20 scaled equations and having done so in the proper scaling,  
21 to then linearize and then to look for linear stability.

22 It's a well-known business. It's been around  
23 for 100 years or so. And there's nothing to it except  
24 finding out your values and matrices.

25 One of the things that turned me off of

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1 Wolfgang's approach was the idea that he's multiplying  
2 matrices, instead of a matrix being multiplied by a vector  
3 equals another vector.

4 I think I will stop there. And I want to  
5 commend everybody that took part in this thing for what I  
6 consider to be a very good effort.

7 CHAIRMAN CATTON: Thank you, George.

8 I guess we've got to decide what to do. And  
9 we've got 20 minutes left. So I'll make a couple of  
10 comments first.

11 I generally found the answers to most of our  
12 questions good. The problem was it was always something  
13 that was somewhere else. And my feeling is if you fix the  
14 report so these things are tied together and where those  
15 questions come up, there's a reference to where I can find  
16 the answer.

17 The scaling, I'm bothered by the use of the  
18 answer in the pi group. And I don't care what my  
19 colleagues say. I think that's the wrong approach. And  
20 that's what gets you 3,000.

21 MR. HOCHREITER: I'm sorry. Could you say  
22 that again, please? You're bothered by?

23 CHAIRMAN CATTON: I'm bothered by the use of  
24 the answer in the pi group.

25 MR. BARKOFF: The answer?

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1 CHAIRMAN CATTON: Yes. If you'd use the  
2 calculated velocity to form the pi group, I don't think  
3 that's the correct way to do business. I think what Novak  
4 suggested is the proper way. You somehow have to relate  
5 your pi groups to the forcing for your problem. And the  
6 forcing in this case is the heat and the pressure. That's  
7 what you've got to do.

8 And if you don't do that, you're going to be  
9 faced with 3,000 or --

10 DR. ZUBER: May I make a comment? I forgot to  
11 make it.

12 CHAIRMAN CATTON: Short one.

13 DR. ZUBER: Short one. Well, when you do  
14 this, you have variables. You scale your -- for example,  
15  $T$ . You have dimensionless temperature. You say  $T$  minus  
16  $T_{\min}$  divided by  $T_{\max}$  minus  $T_{\min}$ .

17 MR. HOCHREITER: Right.

18 DR. ZUBER: So the variable changes from zero  
19 to one.

20 MR. HOCHREITER: Right.

21 DR. ZUBER: So it's a zero one. It may be  
22 multiplied with a large group in front, which means that  
23 one process is more important than the other one. Like,  
24 if you have a large Reynolds number, it means inertia is  
25 much more important than viscosity. And viscosity hurts.

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1 In some cases, you may neglect some terms.  
2 See, if one variable is from zero to one and the other one  
3 is very large, then this is the important factor. If it  
4 varies between zero and one and the coefficient is small,  
5 you can neglect it. This is where engineering judgment --

6 CHAIRMAN CATTON: We've only got a few more  
7 minutes, Novak.

8 DR. ZUBER: I see. But I wanted really to  
9 because this --

10 CHAIRMAN CATTON: I think they have gotten the  
11 message. I guess essentially there are two requirements.  
12 I think it has to be well-documented and scrutable because  
13 we owe something to the public if there's going to be a  
14 certified design.

15 I personally feel that the data is sufficient.  
16 But I think it's based on far more than anything we have  
17 heard or seen today. Somehow that has to be tied  
18 together.

19 Now, what are we going to do? Do you need a  
20 letter? Are you guys looking for us to write a letter?

21 MR. HOCHREITER: No.

22 CHAIRMAN CATTON: No. Then the next question  
23 is whether or not you want to come in and talk to the  
24 whole Committee or do you think this is premature?

25 MR. HOCHREITER: Yes, I think so.

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1 CHAIRMAN CATTON: I think that takes care of  
2 it, then.

3 MR. HOCHREITER: But when we were here in May,  
4 the way we set up the schedule was we wanted to go through  
5 the tests and the scaling first and then get onto the  
6 codes. It was a serial process.

7 CHAIRMAN CATTON: Right.

8 MR. HOCHREITER: We can't live with that.  
9 Now, we recognize there's risk. And we have to accept  
10 that risk. We may be going back and doing something  
11 again.

12 But we need to get on to the codes. We have  
13 been issuing reports to the staff on the validation for  
14 the codes, and we need to get the Subcommittee input in on  
15 the codes.

16 CHAIRMAN CATTON: Okay. I think that's fair.

17 MR. HOCHREITER: And I think the staff needs  
18 the input or would value the input, too.

19 CHAIRMAN CATTON: Now, there were a couple of  
20 other things. One is --

21 MR. SCHROCK: Do we have the documentation?

22 CHAIRMAN CATTON: What's that?

23 MR. SCHROCK: Do we have the documentation on  
24 the codes?

25 MR. HOCHREITER: There is one --

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1 CHAIRMAN CATTON: I have 1970 documentation on  
2 NOTRUMP, 1978 maybe.

3 MR. HOCHREITER: You should have --

4 CHAIRMAN CATTON: I have no current.

5 MR. HOCHREITER: They're 1985, but that  
6 doesn't help a lot.

7 What we have done is the NOTRUMP report was  
8 just issued this week. In there, we do denote the model  
9 changes that were made. But to read about the code, you  
10 do need to look at the original WCAP that was used as a  
11 licensing basis for the code because what we have done is  
12 made changes to the approved licensing code for AP600  
13 specific conditions.

14 So you're going to need both of those reports.  
15 It's WCAP-10054 and 10079, I believe.

16 CHAIRMAN CATTON: I think what would be very  
17 helpful would be, Larry, if you and Paul lay this out.

18 MR. HOCHREITER: Okay. What we --

19 CHAIRMAN CATTON: And, in particular, --

20 MR. HOCHREITER: I'm sorry.

21 CHAIRMAN CATTON: -- for each step, what are  
22 the documents that we need? And make sure that we've got  
23 them. I mean, I've got a whole shelf full of stuff I  
24 don't know what to do with. It's just page after page of  
25 data. And I'm not sure what to do with that.

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1 MR. HOCHREITER: What we could do, and this is  
2 getting back -- now we're talking about a road map for the  
3 codes. Maybe that's what we should do.

4 CHAIRMAN CATTON: I expect to see this other  
5 thing taken care of, too, I would hope.

6 MR. HOCHREITER: All right. Well, let me just  
7 talk about the codes. We can do what you suggested. We  
8 can indicate what the documents are and what you should  
9 look at in the documents and where the information is.

10 And what we need to do is with the staff get  
11 back to the Committee on which code we're going to tackle  
12 first. See, there's going to be COBRA/TRAC or NOTRUMP.  
13 And we've got to get back to the staff and decide which  
14 one we would like to go to the Committee on.

15 CHAIRMAN CATTON: I think the code we know the  
16 least about is NOTRUMP.

17 MR. HOCHREITER: That's right.

18 CHAIRMAN CATTON: We have just gone through  
19 the best estimate business with COBRA/TRAC. So I'm  
20 familiar with it.

21 MR. HOCHREITER: Well, this is also COBRA/TRAC  
22 for long-term cooling.

23 CHAIRMAN CATTON: That COBRA/TRAC for  
24 long-term cooling, if you do things differently, then I  
25 think we should be told what they are.

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1 MR. HOCHREITER: Well, we're using the code as

2 --

3 CHAIRMAN CATTON: If it's just more  
4 computational time, that's something else.

5 MR. HOCHREITER: Yes. Well, there were issues  
6 raised at the May meeting where this was not viewed as the  
7 smartest thing that we have ever done.

8 CHAIRMAN CATTON: I still don't think it's the  
9 smartest thing you have ever done. And what scaling we  
10 found convincing really shows that. It proved it to me.

11 MR. HOCHREITER: Okay. I can accept that.  
12 All right. So we'll take the action. We've got to  
13 interface with the staff to figure out which code we  
14 should be coming to the Committee with first.

15 And that will depend upon the staff review  
16 because I'm assuming you want the staff to have looked at  
17 the documentation and, like Alan did today, at least have  
18 some pronouncement --

19 CHAIRMAN CATTON: That's right.

20 MR. HOCHREITER: -- of where they are on the  
21 review and if they see any problems with it.

22 What we can do for the Committee well in  
23 advance of the meeting is to identify specifically the  
24 documents you should be looking at. And we can identify  
25 the areas that you should look at. We can do that on a

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1 code by code basis.

2 Now, for the road map, particularly for the  
3 test program road map, we apparently didn't -- we were  
4 less than successful in our first attempt.

5 CHAIRMAN CATTON: Yes.

6 MR. HOCHREITER: As I indicated yesterday, I  
7 think to me the expectation level is maybe different from  
8 what we anticipated versus what you were looking for. We  
9 need to close on that. So I think what we're going to  
10 have to do is, if you don't mind, just simply talk to you  
11 specifically --

12 CHAIRMAN CATTON: Sure.

13 MR. HOCHREITER: -- and come up with some kind  
14 of an outline that you think will meet your needs and  
15 expectations.

16 CHAIRMAN CATTON: Well, you know from what  
17 went on what was --

18 MR. HOCHREITER: Oh, yes, but this --

19 CHAIRMAN CATTON: -- causing so much  
20 frustration.

21 MR. HOCHREITER: I know, but this thing kept  
22 growing.

23 CHAIRMAN CATTON: It was, "What about this?"  
24 Well, that was done there, and it's reported over here.

25 MEMBER FONTANA: Yes. But, Ivan, I think it's

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1 real important to come up with a written agreement so you  
2 can both agree on it, it's written.

3 CHAIRMAN CATTON: I agree. I agree. We're  
4 going to do that.

5 MEMBER FONTANA: Yes. We really ought to do  
6 that.

7 MR. HOCHREITER: We're just going to come back  
8 with another rock.

9 CHAIRMAN CATTON: Well, I don't want that.

10 MR. HOCHREITER: All right.

11 CHAIRMAN CATTON: I mean, I'd be here to heft  
12 it.

13 MR. HOCHREITER: It's going to follow you,  
14 though.

15 You had some specific points you brought up at  
16 the beginning of the meeting. Did you want to cover those  
17 now or did you just want us to take those and make sure we  
18 address them?

19 CHAIRMAN CATTON: Well, just make sure you  
20 address them.

21 MR. HOCHREITER: Okay.

22 CHAIRMAN CATTON: Some of it was whining, but  
23 --

24 MR. HOCHREITER: Well, yes. I saw through  
25 that, yes.

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1 (Laughter.)

2 CHAIRMAN CATTON: But, you see, we have --

3 DR. ZUBER: You spelled his name --

4 CHAIRMAN CATTON: -- never seen the --

5 MR. HOCHREITER: That was a test.

6 CHAIRMAN CATTON: -- finished products.

7 DR. ZUBER: You misspelled his name.

8 CHAIRMAN CATTON: We never saw the finished  
9 product on your best estimate effort.

10 MR. HOCHREITER: I'm sorry?

11 CHAIRMAN CATTON: We didn't see --

12 MR. HOCHREITER: The finished product?

13 CHAIRMAN CATTON: -- the finished product.

14 MR. HOCHREITER: It's not finished.

15 CHAIRMAN CATTON: Well, I think that, see, now  
16 you're about to certify an AP600. And that document is  
17 referenced.

18 MR. HOCHREITER: Absolutely.

19 CHAIRMAN CATTON: And it's not finished. I  
20 think you've got to fix that.

21 MR. HOCHREITER: All right.

22 CHAIRMAN CATTON: This is the last time we'll  
23 get to ask you to do that.

24 MR. HOCHREITER: Somehow I don't think that's  
25 the case.

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1           Okay. We'll take a look at that.

2           CHAIRMAN CATTON: Okay. Good. And, with  
3 that, I think I will --

4           MEMBER KRESS: No. You never asked the  
5 Subcommittee members.

6           MEMBER FONTANA: Go ahead. Ask us. Go ahead  
7 and ask us.

8           CHAIRMAN CATTON: Tom?

9           MEMBER KRESS: Well, I do have one. The  
10 object of this meeting was to gauge the sufficiency of the  
11 database --

12          CHAIRMAN CATTON: Yes.

13          MEMBER KRESS: -- for use later in validating  
14 the code. And my criteria for sufficiency were three:  
15 Did they understand the effects of any distortions, and  
16 can they account for them full-scale?; Have they done an  
17 appropriate scaling analysis and identified the pi groups  
18 that are important and quantified those correctly?; And,  
19 three, did the test matrix itself cover all the range of  
20 expected all the range of expected accident conditions  
21 with respect to these pi groups?

22                 My answers to two of those, the distortion  
23 issue, is probably so. Now, I thought they did a fairly  
24 reasonable job of explaining this. The answer to the test  
25 matrix as to whether it covers the right range and so

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1 forth, we have beaten that one to death. I think that  
2 one, the answer is yes.

3           So the only one left is: Have they done a  
4 good job with the scaling analysis in identifying the pi  
5 groups? I think that's where they need to focus. That's  
6 where the problem is.

7           They're on the right track with the process  
8 they have, but I agree that their choices of  
9 non-dimensionalizing the equations were not very good.  
10 And, in particular, I didn't like the almost arbitrary  
11 invocation of orthogonality in the use of vectors where  
12 these are really matrices. They're not really vectors.  
13 They need to go back and get that sort of inappropriate  
14 thing out of the scaling analysis. They have to explain  
15 why their pi groups are much bigger than one.

16           And I agree with Ivan it's clearly their  
17 choice of the normalization parameters, but I don't agree  
18 with Ivan that you can't use a normalization parameter  
19 that is a calculated result. You can do that. It all  
20 depends on the nature of that normalization parameter and  
21 whether it's varying and how strong it's varying over the  
22 time frame you're talking about.

23           If it's quasi-steady state and it's a  
24 relatively small change in that variable over time, you  
25 can use it as a normalization parameter.

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1 CHAIRMAN CATTON: It's just not good practice.

2 MEMBER KRESS: It may not be good practice,  
3 but it's acceptable.

4 CHAIRMAN CATTON: I wouldn't agree with that.

5 MEMBER KRESS: So in my view, where we really  
6 need more work and more convincing is on the scaling, the  
7 pi groups, and how they are quantified. I am convinced  
8 from what I see that when they do that job and wrap it up  
9 that they'll say that they have got the right pi groups  
10 identified from the PIRT charts. And their quantification  
11 if they do it right will show that they know which ones  
12 are important. And it will come out in the end.

13 I just haven't been satisfied and haven't seen  
14 that case made yet.

15 MR. SCHROCK: Tom, what do you think is an  
16 acceptable relationship for judging that you have passed  
17 the criterion? I mean, this seems to be a continuing sore  
18 point. I didn't express it well, but that's the main  
19 problem I have with all those figures.

20 I mean, Westinghouse looks at them and says,  
21 "This is good. It shows our scaling is right, shows our  
22 data are okay. We can do it all." I look at it, and I  
23 don't see that demonstrated there at all.

24 So it's a question of having some kind of a  
25 yardstick for this. How do you see that?

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1 MEMBER KRESS: Well, in terms of the scaling,  
2 I would like to see pi groups that are identified,  
3 independent, and of order of one or less.

4 MR. SCHROCK: I mean, when we look at the  
5 numerical values that are calculated from different  
6 sources of information and we find that they may differ by  
7 a factor of 2 or they may differ by a factor of 50 percent  
8 or 25 percent, where do you say it's okay?

9 MEMBER KRESS: I don't think there is a way to  
10 quantify the uncertainties. And the different ways you  
11 quantify those, two wouldn't bother me very much. But if  
12 you started getting more than two, I'm worried just based  
13 on experience. And with a hand calculation, you probably  
14 ought to get that --

15 DR. ZUBER: I would also suggest to  
16 Westinghouse -- Larry, Dr. Hochreiter, Professor  
17 Hochreiter, Professor Hochreiter, may I have your  
18 attention?

19 MR. HOCHREITER: Yes, sir.

20 DR. ZUBER: When you do this scaling, compare  
21 it to the experimental data. You know, you brought P  
22 versus DP. This is the most important thing if you can  
23 show this, how this gets. And then when the agreement is  
24 found, it's beautiful. When there's agreement, try to  
25 explain it. And you have an example in one of these

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1 graphs. But this is really the proof.

2 MEMBER KRESS: That was another point I meant  
3 to make. When you look at the quantification of the pi  
4 groups in your experiments, leave NOTRUMP out of it. Use  
5 the data.

6 DR. ZUBER: Yes, use the data.

7 MR. HOCHREITER: I think we did penalize  
8 ourselves doing that. All right. And, unfortunately,  
9 I'll admit that that was my idea, much to the dismay of  
10 some of my colleagues.

11 MEMBER SEALE: Well, I won't bore you with my  
12 comments.

13 CHAIRMAN CATTON: You won't?

14 MEMBER SEALE: No.

15 MEMBER FONTANA: My turn.

16 CHAIRMAN CATTON: You will?

17 MEMBER FONTANA: Yes, I will. I feel like a  
18 man from Mars. I can't decide to visit Earth and came  
19 down in the middle of a dogfight.

20 The one comment I think is what we already  
21 said. I really think that we have to agree on what this  
22 road map is going to look like, what the sequence is, and  
23 how much is going to go into the report.

24 I would think that each issue could be  
25 adequately described and support in maybe about ten pages

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1 for each issue and then with the road maps on where to go  
2 find more detail. I really think you can do that if you  
3 agree ahead of time on what it is.

4 CHAIRMAN CATTON: Lots of references.

5 MEMBER FONTANA: Yes.

6 DR. ZUBER: I think that's a very good idea.

7 It could be like an executive summary, the beginning. And  
8 this is the synthesis. This is the signal, the signal.  
9 And for every issue, you have a few pages, few graphs,  
10 "This is how it was addressed. PIRT scaling and PIRT  
11 evaluation scaling distortions." And you do it, and you  
12 have it.

13 And this can be done in one-third of this  
14 report.

15 CHAIRMAN CATTON: Lots of references.

16 MR. HOCHREITER: Okay.

17 CHAIRMAN CATTON: Do you make the references  
18 in an RIA or an RAI?

19 DR. ZUBER: RAI.

20 MR. HOCHREITER: RAI.

21 CHAIRMAN CATTON: Even if it's an RAI so that  
22 you can then go from the statement or the conclusion or  
23 whatever to it and see what it was all about. And if  
24 you'd believe it, you don't have to do it. But if you're  
25 a nonbeliever, you can go and check it.

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1 Half the time you make these statements. And  
2 common sense entering into judgment says, "Yes, he's  
3 right." But it's still nice to know that there are a few  
4 pages of substance somewhere behind it.

5 MR. HOCHREITER: Well, I'll be honest with  
6 you. That's what we tried to do with that report.

7 CHAIRMAN CATTON: But it wasn't well enough  
8 referenced.

9 MR. HOCHREITER: Okay.

10 CHAIRMAN CATTON: I don't think you couldn't

11 --

12 MR. HOCHREITER: All right. That's why I  
13 agree with Dr. Fontana. We will prepare and send to you a  
14 detailed outline and what the content would be, but we  
15 need to get concurrence that that's going to be it before  
16 we invest the time to do it.

17 CHAIRMAN CATTON: And you maybe could get that  
18 to me before our February meeting. And I could discuss it  
19 at the full Committee meeting and make sure everybody is  
20 sort of in tune with it.

21 MR. HOCHREITER: Yes. That would be fine.

22 CHAIRMAN CATTON: Okay.

23 (Whereupon, the open session of the second day  
24 was concluded at 3:00 p.m.)

25

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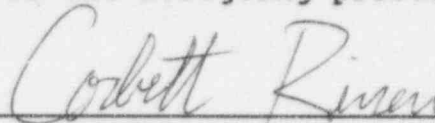
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6

**NRR STAFF PRESENTATION TO  
THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**

**SUBJECT:            INITIAL REVIEW OF AP600 SCALING AND PIRT CLOSURE  
REPORT**

**DATE:                DECEMBER 18, 1996**

**PRESENTER:        ALAN E. LEVIN**

**PRESENTER'S TITLE:  ACTING SECTION CHIEF  
SPECIAL PROJECTS ADVANCED REACTOR SYSTEMS SECTION  
REACTOR SYSTEMS BRANCH  
DIVISION OF SYSTEMS SAFETY AND ANALYSIS  
OFFICE OF NUCLEAR REACTOR REGULATION**

**PRESENTER'S TEL. NO.: (301) 415-2890**

## **OBJECTIVES AND STATUS OF STAFF'S REVIEW OF AP600 SCALING AND PIRT CLOSURE REPORT**

**STAFF REVIEW BEGAN IN SEPTEMBER**

**ASSISTANCE OBTAINED FROM INEL (PIRT/TESTING) AND PROF. GUNOL KOJASOY (SCALING)**

**SPECIFIC GUIDANCE GIVEN TO REVIEWERS TO FOCUS ON KEY OBJECTIVES OF EVALUATION**

- **ARE PIRTs COMPLETE (BOTH PHENOMENA AND RANKINGS)? HAVE RANKINGS BEEN ADJUSTED BASED ON INSIGHTS FROM TEST PROGRAM?**
- **DID TEST PROGRAM COVER IMPORTANT PHENOMENA? HAVE NEW PHENOMENA BEEN ADDRESSED?**
- **HAVE EFFECTS OF SCALING DISTORTIONS BEEN ADEQUATELY ADDRESSED?**
- **ARE SCALING ANALYSES APPROPRIATELY PERFORMED?**
- **IS TOP-DOWN INTEGRAL SYSTEM SCALING METHODOLOGY APPLIED PROPERLY?**
- **DO SCALING ANALYSES SUPPORT A CONCLUSION THAT TEST DATA CAN BE USED TO VALIDATE COMPUTER CODES FOR AP600 ANALYSES?**
- **ARE INSIGHTS FROM TEST PROGRAM APPROPRIATELY CONSIDERED IN DEVELOPMENT OF ANALYTICAL MODELS?**
- **DO ANY MAJOR "HOLES" STILL EXIST IN DESIGN CERTIFICATION DATABASE?**

**OBJECTIVES AND STATUS OF STAFF'S REVIEW OF  
AP600 SCALING AND PIRT CLOSURE REPORT  
(cont'd)**

**COMMENTS RECEIVED FROM EXTERNAL REVIEWERS; STAFF REVIEW PROCEEDED IN PARALLEL  
INITIAL COMMENTS PROVIDED TO WESTINGHOUSE FOR FURTHER DISCUSSION**

**PRELIMINARY RESULTS OF REVIEW**

**AP600 PIRTs APPEAR TO BE APPROPRIATE (PHENOMENA AND RANKINGS); SOME  
RE-RANKING WAS DONE**

**IN GENERAL, NEW/UNEXPECTED PHENOMENA AND SCALING DISTORTIONS HANDLED  
APPROPRIATELY**

**OVERALL SCALING APPROACH IS ACCEPTABLE**

**DATA ARE APPROPRIATE FOR USE IN VALIDATING COMPUTER CODES FOR AP600  
ANALYSES**

**NO MAJOR "HOLES" IDENTIFIED**

**"DISCUSSION ITEMS" TO BE ADDRESSED BY WESTINGHOUSE**

**NOTE: INSIGHTS FROM CONFIRMATORY TEST PROGRAM CONSIDERED IN REVIEW, BUT  
CONFIRMATORY DATA IS NOT CONSIDERED AS PART OF THE AP600 DESIGN CERTIFICATION  
DATABASE**

**WORK REMAINING TO ACHIEVE CLOSURE OF  
REACTOR SYSTEMS TEST PROGRAM REVIEW**

**STAFF ACTIVITIES**

**COMPLETE REVIEW OF REVISED PRHR REPORT**

**REVIEW RESPONSES TO OUTSTANDING RAIs AND DISCUSSION ITEMS**

**PREPARE FSER INPUT**

**WESTINGHOUSE ACTIVITIES**

**RESPOND TO OUTSTANDING RAIs ON OSU AND ADS PROGRAMS, SCALING/PIRT  
DISCUSSIONS ITEMS/RAIs, AND ANY RAIs DEVELOPED FROM PRHR REPORT**

**CMT AND SPES-2 REVIEWS CONDITIONALLY CLOSED IN SDSER ARE NOW CONSIDERED TO BE  
COMPLETED**