

ORIGINAL **ACRSF-2001**

OFFICIAL TRANSCRIPT OF PROCEEDINGS

Agency: Nuclear Regulatory Commission
Advisory Committee on Reactor Safeguards

Title: Subcommittee Meeting on Thermal Hydraulic Phenomena

Docket No.

LOCATION: Monroeville, Pennsylvania

DATE: Tuesday, March 15, 1994

PAGES: 1 - 5
263 - 274

Closed session pages: 6-262

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PUBLIC NOTICE BY THE
UNITED STATES NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: March 15, 1994

The contents of this transcript of the proceedings of the United States Nuclear Regulatory Commission's Advisory Committee on Reactor Safeguards, (date) March 15, 1994, as Reported herein, are a record of the discussions recorded at the meeting held on the above date.

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UNITED STATES NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE MEETING ON THERMAL HYDRAULIC PHENOMENA

Westinghouse Energy Center
East Auditorium
National Pike
Monroeville, Pennsylvania

Tuesday, March 15, 1994

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1 PARTICIPANTS:
2

3 IVAN CATTON - Chairman, ACRS

4 PETER R. DAVIS - Member, ACRS

5 ROBERT L. SEALE - Member, ACRS

6 V.J. DHIR - Consultant

7 WOLFGANG WULFF - Consultant

8 NOVAK ZUBER - Consultant

9 L.E. HOCHREITER - Westinghouse

10 LARRY CONWAY - Westinghouse

11 F. DELOSE - Westinghouse

12 J. CUNNINGHAM - Westinghouse

13 ROBERT C. HABERSTROH - Westinghouse

14 BRUCE RARIG - Westinghouse

15 ALAN LEVIN - NRC/NRR

16 TIM COLLINS - NRC/NRR

17 PAUL BOEHNERT - ACRS Staff
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P R O C E E D I N G S

[8:43 a.m.]

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2
3 MR. CATTON: The meeting will now come to order.

4 This is a meeting of the ACRS Subcommittee on
5 Thermal Hydraulic Phenomena.

6 I'm Ivan Catton, Chairman of the Subcommittee.
7 ACRS Members in attendance are Pete Davis and
8 Robert Seale.

9 ACRS Consultants are Wolfgang Wulff and Novak
10 Zuber, and Dhir is coming in on the red-eye.

11 We should be in really good shape today.

12 The purpose of today's session is for the
13 Subcommittee to continue its review of the CMT Test Program.
14 Tomorrow, the Subcommittee will begin review of the Passive
15 Containment Cooling System Test Program.

16 Additionally, the Subcommittee, as observers,
17 attended a meeting held on March 14, 1994, between
18 representatives of the NRC staff and Westinghouse to discuss
19 particulars of the Core Makeup Tank Test Program.

20 Paul Boehnert is the Cognizant ACRS Staff Member
21 for this meeting.

22 The rules for participation in today's meeting
23 have been announced as part of the notice of this meeting
24 previously published in the Federal Register on March 1,
25 1994.

1 A transcript of the meeting is being kept and will
2 be made available as stated in the Federal Register notice.

3 It is requested that each speaker first identify
4 himself or herself and speak with sufficient clarity and
5 volume so that he or she can be readily heard.

6 We have received no written comments or requests
7 for time to make oral statements from members of the public.

8 Before coming up here, one of my colleagues handed
9 -- what is, it 10 CFR Part 52? Actually, it was with
10 respect to one of your competitors, but I read it, the parts
11 that are important to us.

12 "Certification will be granted only if:

13 "The performance of each safety feature of the
14 design has been demonstrated through either analysis,
15 appropriate test programs, experience, or a combination
16 thereof;

17 "Interdependent effects among the safety features
18 of the design have been found acceptable by analysis,
19 appropriate test programs, experience, or a combination
20 thereof;"

21 And thirdly, "Sufficient data exists on the safety
22 features of the design to assess the analytical tools for
23 safety analysis over a sufficient range of normal operating
24 conditions, transient conditions, and specified accident
25 sequences, including equilibrium conditions." I'm not sure

1 that that meant.

2 That's a pretty interesting charter. I had no
3 idea that it was so specific.

4 I think what we ought to do is just move right on
5 to Bryan McIntyre. He's late, too? He's probably still
6 behind a school bus.

7 Okay, Larry. Are we going into closed session
8 now? Okay. Go into closed session in the transcript.

9 [Whereupon, at 8:45 a.m., the meeting continued in
10 closed session.]

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OPEN SESSION

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MR. CATTON: Okay. Thank you, Larry.
Alan?

MR. LEVIN: Yes. This is very brief, I hope.
[Slide.]

MR. LEVIN: What we've been requested to do is sort of give a thumbnail of our impressions of yesterday's meeting directly between Westinghouse and the staff and then to talk a little bit about what we've done and what we've been doing and what we're going to do.

So, this is the last slide in your packet, and I'm going to put it up first. It's very descriptive, you'll see.

[Slide.]

MR. DAVIS: You weren't too impressed with the meeting.

MR. LEVIN: Well, I didn't bother to write anything on there.

In general, I think that we had the same sorts of comments yesterday, perhaps not quite as detailed, as your consultants were giving today.

I will put on the record what I said yesterday, that having been at SPES and seen the one test there, the one matrix test there that has been run, and understanding a little bit the systems behavior now and, again, keeping in

1 mind that SPES is not the AP600 but it looks quite a bit
2 like it, I'm more comfortable now with the concept of the
3 CMT, and I understand a little bit better how it works.

4 I think that what was just said a couple of
5 minutes ago, that one of the saving graces here is that
6 everything happens very slowly -- the draining rate is two-
7 thirds of a foot to one foot per minute for the small break,
8 things happen very slowly, they have time to equilibrate,
9 and it may very well be that we'll be able to get a one-
10 dimensional description of this thing that works reasonably
11 well.

12 I still have some concerns about working up from
13 something that's a foot-and-a-half in diameter to something
14 that's 12 feet in diameter, and where there is the potential
15 for multi-dimensional effects, that would not be captured in
16 the test facility. They have to work the scaling a little
17 bit and whatever else. Maybe Westinghouse would be amenable
18 to putting a six-foot-diameter plexiglass model together or
19 part of it or something like that. I don't know.

20 I was also happy to see that, small-scale though
21 it is, it is a good indication of the commitment by
22 Westinghouse to understand what's going on here and to make
23 a good case, and I think they're to be commended for that.

24 So, in general, I think now we understand, on the
25 basis of yesterday's meeting and what we've seen from the

1 scaling report, where Westinghouse is going, and we will
2 continue to review information that they give us, as they
3 provide it to us.

4 [Slide.]

5 MR. LEVIN: Just to give you a history of where
6 we've been before I tell you where we are and where we're
7 going, we started looking at this about three years ago.

8 In about 1991, Westinghouse came in with a
9 preliminary design for this facility. We provided
10 considerable comments on facility design and
11 instrumentation, and over the intervening years,
12 Westinghouse altered the facility design twice.

13 The first was to redesign the connections between
14 the steam water reservoir and the test article to be more
15 representative of what they have in the plant, and the
16 second thing was the original test article, for those of you
17 who might remember back to 1991 or so, was about six feet
18 long and two feet in diameter, and now it's 10 feet long,
19 and I think that's an improvement, too, and the third thing
20 that's been done is, following the February 1993 meeting,
21 when the ACRS had their first look at this, Westinghouse
22 added some instrumentation.

23 We have also reviewed the test matrix, the
24 original test matrix and its subsequent revisions. We have
25 recommended changes in test parameters, drain flow rates,

1 condensation water levels, so forth, and in the types and
2 number of tests to be performed, and in general,
3 Westinghouse has been quite responsive to staff comments.
4 They have made these alterations in the test matrix, and I
5 think that the test matrix that they have now is very nice.
6 I like what I've seen.

7 [Slide.]

8 MR. LEVIN: As far as the scaling report is
9 concerned, we requested a scaling report at last year's
10 meeting. Actually, we had been discussing it sometime
11 before that, but we put it on the record last year, and
12 Westinghouse committed to provide a report based on a group
13 of identified key phenomena. Those phenomena were provided
14 to the staff a couple of weeks after that meeting, and we
15 concurred with Westinghouse's general approach.

16 The draft of the scaling report was reviewed this
17 year, a couple of months ago, and the final version that you
18 have, the Rev. 0 version, was provided to us last month, and
19 we have done an initial review of it. This is a little bit
20 better than OSU, by the way. We got some criticism from the
21 ACRS for not being able to talk about our review of the
22 scaling report, because we hadn't had it long enough. We
23 have gotten through a review of this, at least an initial
24 one.

25 In general -- well, you've seen the report -- it,

1 to some extent, mirrors the approach taken for the OSU
2 facility, the top-down, bottom-up scaling approach. We
3 think it seems appropriate, but I think we agree with the
4 ACRS that additional work is needed on some of the details,
5 and we have provided our comments in the form of a request
6 for additional information that was transmitted to
7 Westinghouse last month, and in fact, there are some
8 additional comments that I have that I thought had also been
9 transmitted that have not, and I'm going to see that they
10 get up there when I get back, because they reflect some of
11 the discussion that's been going on here about some of the
12 heat transfer correlations.

13 The Revision 0 version contains corrections. The
14 comments were provided on the basis of the draft report.
15 The Rev. 0 version contains some corrections and
16 clarifications that address a couple of our comments, but
17 some of the other more detailed technical questions have not
18 been resolved.

19 The major effects, major issues, include the
20 effect of the steam diffuser, which is not included in the
21 scaling report, the multi-dimensional behavior aspect,
22 thermal stratification, transition behavior, the same sorts
23 of things that we've been discussing here, and we do expect
24 that Westinghouse will issue a Rev. 1 version of the scaling
25 report that should address our comments and yours.

1 [Slide.]

2 MR. LEVIN: What we'll be doing in the coming
3 months -- we will continue to pursue resolution of comments
4 on the scaling report.

5 We will monitor select sites -- selected tests on-
6 site, as the test program proceeds.

7 We will review the results of the test program,
8 the results of the integral test facilities, and determine
9 for ourselves if we believe that the testing has adequately
10 covered the phenomenological issues, appropriate ranges of
11 operating conditions.

12 We will review the code work, and we will finally
13 have an evaluation of the test analysis program as part of
14 the Safety Evaluation Report for the AP600, and that will be
15 on the schedule as determined -- as Westinghouse's testing
16 proceeds.

17 MR. CATTON: When do you plan to have your
18 contribution to the SER ready, or a draft? Just a guess.

19 MR. LEVIN: Well, if they finish on schedule, we
20 could have sort of a first look, a very, very rough sort of
21 draft, around September, which is when the first -- which is
22 when I've been told the input for the first draft is
23 supposed to be in.

24 MR. CATTON: So, your SER, then, would include
25 SPES, OSU, the CMT tests.

1 MR. LEVIN: Let me take a step back.

2 MR. CATTON: See, at some point, we've got to
3 write a letter, and I'm trying to decide what to do.

4 MR. LEVIN: We are, too, to a certain extent, and
5 the draft SER, to the extent that specific issues have been
6 addressed by the test program, we can address those in the
7 DSER. Now, I've been told input for that is due for those
8 areas related to testing in September of this year.

9 To the extent that issues related to testing have
10 not been addressed within the test programs, because the
11 test programs haven't been completed yet or we don't have
12 the data analysis review, those will have to stay open to be
13 addressed either in a second stage of the DSER or the FSER.
14 I'm not sure exactly how it's going to work.

15 MR. COLLINS: Excuse me, Ivan. My name is Tim
16 Collins from the Reactor Systems Branch.

17 We could provide an SER at any point in the
18 schedule that we're asked to. It's just a matter of the
19 size of the open items that come in with the SER, and that
20 depends a lot on what we see from the test program itself.

21 So, right now, our management says we'll provide a
22 DSER, I believe, in September or October. So, we will
23 provide one on that schedule, but the size of the holes that
24 are in there depends a whole lot on what the test program
25 has shown.

1 MR. CATTON: I understand.

2 MR. COLLINS: It's not so much a matter of our
3 planning; it's what we're going to be told to provide, the
4 schedule we're going to be told to meet.

5 MR. DAVIS: There was a suggestion at one time to
6 split the SER and put one out in May that had everything
7 except the test program. Is that not now the plan?

8 MR. COLLINS: Well, whenever we provide --
9 whenever the DSER schedule comes due, we will address as
10 much of the test program as we can at that point. We're not
11 going to divorce it completely from our initial input. If
12 there is something that we can add to the SER at that point,
13 we'll add it, but it's very nebulous. It's more a matter of
14 the size of the open items than the schedule. Our Final SER
15 is going to be tied to the completion of their test program.
16 That's really the way to look at it.

17 MR. LEVIN: You'll hear tomorrow, I guess, for the
18 containment testing, that the analysis part of it won't be
19 done until sometime the middle of next year. So, our input
20 has to be, in some sense, reactive to what we're provided
21 and on the schedule on which we're provided it by
22 Westinghouse.

23 We will do our best not to hold things up any
24 longer than we have to when we get the information that
25 we've asked for.

1 MR. CATTON: It's just that, every time we meet
2 the with Commission, I'm asked.

3 MR. LEVIN: Us, too.

4 MR. CATTON: Okay.

5 MR. LEVIN: It's a little bit frustrating not to
6 be able to have a schedule to be able to work to, and I know
7 that Westinghouse is just as concerned about these kinds of
8 issues as we are, and they're working to try to finish their
9 test program, and we're working to try to work -- to come
10 along with them with our review of their test data and their
11 analysis and, ultimately, at the end, when they have
12 incorporated all these things into their analysis models, to
13 a re-analysis of those things in Chapter 15 of the SSAR, and
14 that's the end point.

15 So, we'd like to get there, too. We will provide
16 it as we are able to do it.

17 MR. CATTON: Other than your concerns about the
18 scaling report, kind of similar to our own, I haven't seen
19 anything else that is an open issue with respect to NRR. Am
20 I missing something? That's really the only thing you
21 mentioned.

22 MR. LEVIN: Well, I think the --

23 MR. CATTON: CMT testing by itself.

24 MR. LEVIN: CMT testing by itself. The test
25 matrix, I think, in general, we're pretty happy with. I

1 think we've come to the conclusion that the key phenomena
2 will be addressed through the test program.

3 MR. CATTON: I'm not sure I can speak for the rest
4 of us here, but my own feeling is that there should be some
5 counterpart tests with OSU.

6 MR. LEVIN: I don't disagree with that. I'm
7 talking about the CM test program as it sits.

8 Now, when we go back and look at the OSU test
9 matrix and compare it to this one -- I know that there is a
10 good overlap between this and SPES.

11 MR. CATTON: Yes.

12 MR. LEVIN: We've already been able to see that.

13 You know, we'll see how the things get integrated,
14 but looking at a snapshot of the CMT test, it looks pretty
15 good, and we've been around the block a couple of times with
16 Westinghouse on what ought to be included, and where there
17 have been differences, we have ironed them out, and at this
18 point, I think it's in pretty good shape.

19 The major concerns that I have are within the
20 scaling logic and the natural extension of that from -- how
21 do you get from three facilities, the maximum diameter of
22 the CMT is a couple of feet, up to something that's 12 feet
23 in diameter and be able to make the case that the things
24 that are being neglected in the analysis are, in fact,
25 negligible, and those are my major concerns, and I think I

1 expressed some of these to Larry yesterday.

2 I mean, in general, looking at code calculations
3 doesn't make me as comfortable as looking at experimental
4 data either, but looking at experimental data in something
5 that's this big when I'm trying to figure out what's going
6 to happen in something that goes from here to there, I have
7 to worry about that, too.

8 MR. CATTON: I would agree with that.

9 Well, fellow Subcommittee members, what do you
10 think we should do?

11 MR. DAVIS: Adjourn.

12 MR. CATTON: I think, before we do that, I would
13 like the consultants to write me a report and address the
14 completeness as far as Part 52 is concerned, what you feel
15 about the performance of the safety feature, which is the
16 CMT, whether or not, with what -- the data that -- the test
17 program as outlined, they're going to be able to demonstrate
18 it. Is the test program appropriate?

19 I guess we wouldn't be writing a letter now,
20 because it would sort of be out of place with respect to the
21 staff.

22 You're going to have to take them in the spirit
23 that they're given, it's not a Committee opinion, and I
24 don't want to be hammered with them later like I was in
25 another case.

1 I think today's meeting is adjourned, and we
2 reconvene at 7:45 a.m. tomorrow.

3 [Whereupon, at 5:28 p.m., the meeting was
4 adjourned, to reconvene Wednesday, March 16, 1994, at 7:45
5 a.m.]

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REPORTER'S CERTIFICATE

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

NAME OF PROCEEDING: ACRS Thermal Hydraulic Phenomena

DOCKET NUMBER:

PLACE OF PROCEEDING: Monroeville, PA

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.

Ann Hundley

Official Reporter
Ann Riley & Associates, Ltd.

**NRC STAFF REVIEW OF
WESTINGHOUSE'S CORE MAKEUP TANK
TEST PROGRAM**

ALAN LEVIN

REACTOR SYSTEMS BRANCH

**ACRS THERMAL HYDRAULICS SUBCOMMITTEE
MEETING**

MARCH 15, 1994

FACILITY DESIGN AND TEST MATRIX REVIEW

STAFF REVIEW OF CMT TEST FACILITY DESIGN/INSTRUMENTATION AND TEST MATRIX BEGAN IN 1991

STAFF PROVIDED EXTENSIVE COMMENTS ON FACILITY DESIGN AND INSTRUMENTATION

WESTINGHOUSE HAS ALTERED FACILITY TWICE SINCE ORIGINAL DESIGN WAS SUBMITTED TO STAFF

REDESIGN OF CONNECTIONS BETWEEN TEST ARTICLE AND DRAIN TANK TO MORE CLOSELY RESEMBLE COLD LEG/PRESSURIZER/CMT CONFIGURATION

REDESIGN OF TEST ARTICLE (NOW 1/2-LENGTH INSTEAD OF ABOUT 1/3-LENGTH)

ADDITIONAL INSTRUMENTATION HAS ALSO BEEN PROVIDED, PER STAFF AND ACRS COMMENTS (FOLLOWING FEBRUARY 1993 REVIEW MEETING)

STAFF ALSO PERFORMED EXTENSIVE REVIEW OF TEST MATRIX, AND RECOMMENDED CHANGES IN VARIOUS TEST PARAMETERS (DRAIN FLOW RATES, CONDENSATION WATER LEVELS, PRESSURES, ETC.) AND IN TYPES AND NUMBER OF TESTS TO BE PERFORMED

WESTINGHOUSE HAS GENERALLY BEEN RESPONSIVE TO STAFF CONCERNS, AND HAS REVISED TEST MATRIX TO ADDRESS STAFF COMMENTS

SCALING REPORT REVIEW

STAFF REQUESTED SCALING REPORT AT FEBRUARY 1993 MEETING

WESTINGHOUSE COMMITTED TO PROVIDE REPORT BASED ON A GROUP OF "KEY PHENOMENA"

"KEY PHENOMENA" PROVIDED TO STAFF SHORTLY AFTER 2/93 MEETING; STAFF CONCURRED WITH WESTINGHOUSE'S GENERAL APPROACH

DRAFT OF SCALING REPORT WAS REVIEWED IN JANUARY 1994, WITH FINAL "REVISION 0" VERSION PROVIDED IN FEBRUARY

APPROACH MIRRORS THAT USED FOR OSU (APEX) FACILITY (TOP DOWN/BOTTOM UP SCALING)

GENERAL CONCEPT SEEMS APPROPRIATE, BUT ADDITIONAL WORK IS NEEDED ON THE DETAILS OF THE SCALING ANALYSIS

STAFF HAS PROVIDED COMMENTS ON DRAFT VERSION IN REQUEST FOR ADDITIONAL INFORMATION TRANSMITTED TO WESTINGHOUSE IN FEBRUARY

REV. 0 VERSION CONTAINS CORRECTIONS AND CLARIFICATIONS THAT ADDRESS SOME STAFF COMMENTS, BUT OTHER QUESTIONS HAVE NOT YET BEEN RESOLVED

MAJOR ISSUES INCLUDE EFFECT OF STEAM DIFFUSER, MULTIDIMENSIONAL BEHAVIOR IN PLANT CMT (VS. 1-D BEHAVIOR EXPECTED IN TEST ARTICLE), THERMAL STRATIFICATION, AND TRANSITION FROM RECIRCULATORY BEHAVIOR TO DRAINING

STAFF EXPECTS THAT WESTINGHOUSE WILL ISSUE A "REV. 1" VERSION OF THE REPORT THAT WILL INCORPORATE NEW DESIGN FEATURES (E.G., STEAM DIFFUSER) AND WILL ADDRESS OTHER STAFF COMMENTS

FUTURE PLANS AND ACTIVITIES

STAFF WILL CONTINUE TO PURSUE RESOLUTION OF COMMENTS ON SCALING REPORT

CMT TESTING IS NOW UNDERWAY, AND STAFF WILL MONITOR SELECTED TESTS ON-SITE AS PROGRAM PROCEEDS

RESULTS OF TEST PROGRAM WILL BE REVIEWED, ALONG WITH RESULTS FROM INTEGRAL TEST FACILITIES, TO DETERMINE IF TESTING HAS ADEQUATELY COVERED IMPORTANT PHENOMENOLOGICAL ISSUES AND RANGES OF OPERATING CONDITIONS

APPLICATION OF TEST RESULTS TO COMPUTER MODELS FOR SSAR ANALYSES WILL ALSO BE REVIEWED

EVALUATION OF TEST PROGRAM WILL BE INCLUDED IN AP600 SER

STAFF VIEWS ON MARCH 14 MEETING WITH
WESTINGHOUSE