

CERTIFIED BY:

Ivan Catton - 9/9/93

CERTIFIED

DATE ISSUED: 8/3/93

ACRS-2889

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
THERMAL HYDRAULIC PHENOMENA SUBCOMMITTEE MEETING
W AP600 ANALYSIS METHODOLOGY AND TEST PROGRAMS
JULY 22-23, 1993
BETHESDA, MARYLAND

PDR
3/25/94

MEETING MINUTES

PURPOSE:

The purpose of the meeting was for the Subcommittee to continue its review of the thermal hydraulic analytical and experimental programs being conducted by the Westinghouse Electric Corporation (W) in support of its certification effort for the AP600 passive plant design.

ATTENDEES:

Principal meeting attendees included:

- ACRS
- I. Catton, Chairman
- P. Davis, Member
- T. Kress, Member
- E. Wilkins, Member
- V. Schrock, Consultant
- W. Wulff, Consultant
- N. Zuber, Consultant

- NRC
- B. Sheron, RES
- R. Jones, NRR
- R. Caruso, NRR
- L. Shotkin, RES
- D. Bessette, RES
- F. Orr, NRR

- Westinghouse
- B. McIntyre
- L. Hochreiter
- E. Piplica
- J. Butler

CLOSED SESSIONS:

Portions of the meeting were held in closed session to discuss information deemed proprietary by the Westinghouse Electric Corporation; a summary of these closed sessions is given in Attachment I to these Minutes.

[ATTACHMENT I REMOVED - FOIA EX(b)(4)]

MEETING HIGHLIGHTS:

Meeting Discussion Topics

The following topics were discussed during the subject meeting (presenting organization given in parenthesis - closed sessions noted):

- W AP600 Analysis Methodology (W)
(Closed Session)
- Update of W T/H Test Program Elements (W)

RSO
0/1

DESIGNATED ORIGINAL

Certified By

EMB

300011
9403300071 930909
PDR ACRS
2889 PDR

- Discussion of ACRS Consultants Concerns/Issues Pertaining to the W T/H Test Program Elements (ALL)
(Closed Session)
- Status of NRR's Review of W Analytical and Experimental Programs Supporting AP600 Design Certification (NRR)
- Status of NRR In-House Analytical Program (NRR)
- Future Subcommittee Meetings Relative to AP600 Design Certification Review (NRR)
- Comment on NRR User Needs Requests and Counterpart Tests (RES)

A summary of each of these topics is given below, along with the major concerns/comments on each that were noted by the Subcommittee's Members and Consultants.

W AP600 Analysis Methodology

(Closed Session - W Proprietary Information - see Attachment I to these Minutes).

Update of W T/H Test Program Elements

W noted the following information concerning their T/H test programs:

- CMT Tests - separate effects tests conducted at full pressure and temperature. Test facility located at the W Walts Mill site, Madison, Pa. Construction is complete. Cold pre-operational tests are concluded and hot pre-op tests are underway. The start of matrix tests is scheduled for August 2, 1993.
- ADS Tests - Phase B tests (prototypical tests of performance of the Stage 1-3 blowdown valves) are scheduled to begin in February, 1994. The tests are being conducted at the VAPORE facility in Casaccia, Italy.
- SPES Tests - Full-height, full-pressure integral facility, 1/395 volume scale. The SPES facility is located in Piacenza, Italy. Tests simulating SBLOCA, SGTR, and steam line break planned. Eight of ten planned cold shakedown test are now complete. Hot shakedown testing is scheduled to start August 23, and matrix testing is to begin on September 27, 1993.
- OSU Facility - Low pressure (400 psig) 1/4-scaled-

height test rig. Complete simulation of the RCS and passive safety systems, as well as most non-safety systems of interest. Tests designed to provide data for verification of code calculations of low pressure behavior as well as that for long-term core cooling. Shakedown test to commence August 16, 1993; matrix tests scheduled to begin in early-October, 1993.

Subcommittee Concerns - The following specific concerns were noted regarding the test programs:

- The geometry of the CMT SE tests is non-prototypic. W indicated that they are aware of this fact.
- It was noted that it doesn't appear feasible to simulate water flow through the ADS blowdown valves due to the physical limitations of the test facility. (Single-fluid liquid flow through these valves is expected during some or all parts of blowdown transients for the actual plant design). W representatives said that they would investigate this matter.

Discussion of ACRS Consultants' Concerns/Comments Pertaining to the W T/H Test Program Elements
(Closed Session - W Proprietary Information - See Attachment I to these Minutes).

Status of NRR's Review of W Analytical and Experimental Programs Supporting AP600 Design Certification

Representatives of NRR provided an overview of the status of their review of both the W experimental and analytical programs noted above. In brief, the following points were noted:

- Regarding its review of the experimental programs, NRR noted in summary that W has, in general, not been responsive to the staff's requests for information, concerns, or comments on the individual programs. For example:

- Passive RHR Heat Exchanger Tests - NRR does not consider these (completed) tests to be prototypic of the current plant design. Additional relevant data will be needed from the tests planned at SPES and OSU.
- CMT Tests - No scaling rationale presented; the test matrix is lacking needed tests to explore phenomena associated with fluid recirculation behavior and depressurization/draining.

- ADS Tests (4th stage valves) - W has taken the position that tests of these valves are "confirmatory component tests" to be performed after design certification. NRR has not accepted this position; additional NRR/W discussion is to follow.
- NRR has expressed concerns/provide inquiries regarding details associated with the SPES and OSU integral tests. In large part, W has yet to respond.

Discussion of the above situation lead to the statement (by both W and NRR) that W is proceeding with this test program at their own risk. As such, additional testing/follow-up actions may be required of W by NRR pursuant to design certification approval.

Regarding the status of NRR's review of the W codes being used in support of AP600 design certification, it was noted that, by and large, NRR has yet to receive the necessary documentation in support of its review. Review of the necessary codes is currently scheduled to be complete by late-1994.

Status of NRR In-House Analytical Program

In response to concerns expressed by the Commissioners, among others, NRR has established an in-house Analytical Support Group. The Group was formed in February, 1992 and consists, at present, of four individuals who are lead by Mr. R. Caruso. They function as a service organization; individuals are rotated through the Group to garner analytical expertise. These individuals, in turn, are expected to carry this expertise back to their home organizations.

At the present time, the Support Group is performing analyses using the RELAP5/MOD3 and TRAC codes. They are also conducting some containment analysis exercises in association with the issue of severe accidents.

The Subcommittee expressed approval with the mission of the Group. They urged Mr. Caruso to ensure that the Group works to identify code deficiencies and report such deficiencies to RES for their consideration.

Future Subcommittee Meetings

NRR representatives indicated that they see a need for at least five additional meetings with the T/H Phenomena Subcommittee between now and early-1995 in support of their review of the W AP600 T/H test/analysis Program.

RES Comments on NRR User Needs Requests and Counterpart Tests
RES representatives detailed the RES activities for the NRR user needs requests related to its review of the AP600 design certification review. A set of eleven actions were tasked to RES as a result of two NRR formal User Needs requests, dated December 11, 1990 and November 15, 1991. RES is addressing each Task in turn.

Concerning the issue of counterpart testing, while no formal agreement between NRC and W exists regarding this issue, a total of seven tests will be run that are common to all three of the major test facilities: OSU and SPES (W), and ROSA-V (NRC). Further, there will be eight tests run that are common to the ROSA and OSU facilities, and nine tests will be run that are common to ROSA and SPES.

Analyses will be performed by RES for five of the seven common tests noted above as well as two of the OSU/SPES common tests (MSLB and single-tube SGTR). RES plans to also run analyses of all twelve of the planned ROSA-V AP600 tests.

In response to questions, it was noted RES believes that the issue of the impact of CMT behavior will be important for the transients involving double-ended guillotine breaks in the DVI and cold-leg pressure balance lines. RES also noted that the NRR and RES workstations to be used for in-house analysis activities will be connected to allow interactive capability.

Concluding Remarks

Dr. Catton indicated that in his opinion the W test and analysis program appears to be well-structured and that NRR/RES seems to have things "well-in-hand". He noted that the Subcommittee has planned a visit and associated Subcommittee Meeting at the location of the W OSU facility (Corvallis, Oregon) during September, 1993.

The Subcommittee Chairman indicated that he would report the results of this meeting to the ACRS during its August full-Committee Meeting.

The meeting was adjourned at 12:10 pm on July 23, 1993.

FUTURE SUBCOMMITTEE ACTIONS ON THIS MATTER AND ITEMS FOR FOLLOW-UP

Future Subcommittee Actions

As noted above, the T/H Subcommittee will hold its next meeting on review topic in September (September 22, 1993) to review the W

program of analyses and tests planned at the OSU facility located on the OSU campus in Corvallis Oregon.

Review of the W T/H AP600 analytical and experimental programs (exclusive of the PCCS test/analysis program - see below) appears timely following the September 21, 1993 Subcommittee meeting noted above.

Follow-on Actions

The following action items were generated during the above meeting discussions:

- The Subcommittee will schedule a meeting in order to review the details of the W PCCS test program and associated analyses effort using the GOTHIC code. W representatives suggested that this meeting be held in the December, 1993/January 1994 time frame.
- W is to provide copies of the WCAP reports associated with the NOTRUMP code.
- W is to provide a copy of the test reports/facility description for the PRHR heat exchanger tests.
- Dr. Catton requested that W provide formal documentation of the rationale for de-coupling the thermal analyses of the interactions between the PCCS and the RCS.
- Copies of the complete scaling analysis report for the OSU facility are to be provided to the Subcommittee in support of its meeting on same planned for September 21, 1993. (Note: Copies of this report were provided to P. Boehmert via a July 28, 1993 letter from W).
- W is to provide the Subcommittee with a copy of its scaling logic analysis in support of its CMT separate effects tests. (Report should be available in mid-August, 1993).
- A copy of the final version of the scaling report for the SPES high-pressure integral test facility is to be provided to the Subcommittee by W in the near future.
- The Subcommittee requested a copy of the ~ 1300-node W C/T analysis model of the AP600 plant design.
- W committed to providing the Subcommittee with a copy of the Henry-Fauske critical flow model used in the NOTRUMP code.

- Regarding the ADS Phase B tests, W committed to informing the Subcommittee as to how it will simulate the conditions associated with passing single-phase liquid through the valves during blowdown.
- The Subcommittee requested information pertaining to the scaling rationale being pursued by W for their test programs. Specifically, W was requested to provide information pertaining to the non-dimensional scaling groups used for the OSU facility scaling analysis. Dr. Zuber also recommended that W provide similar information for its other test facilities, and that NRC-RES perform a similar exercise for the ROSA-V test facility.
- W was requested to provide a copy of its Facility Description Report for OSU, when its issued.
- W will provide a list of reference documents pertaining to the capability of the W COBRA TRAC code to model in three dimensions.
- P. Boehnert is to send a copy of the excerpted portion of the meeting transcript dealing with the round-table discussion of the ACRS Consultants' comments on the W test/analysis program to said Consultants for their review. (Note: A copy will also be sent to Dr. "V.J. Dhir for his review as well).
- W is to review their approach to modeling of both hot-leg and cold-leg SGTR events with an eye to ensuring key phenomena are captured on a "best-estimate" basis and inform the Subcommittee of the results of said review.
- W is to inform P. Boehnert as to the mechanism for resolution of some of ACRS Consultant V. Schrock's comments pertaining to analysis methods associated with the ADS Test Program that require the involvement of W personnel not present at this meeting.
- L. Shotkin is to provide the Subcommittee with copies of the lecture notes associated with a training course conducted at RES on the use of the RELAP5/MOD3 code. (Note: Pursuant with prior arrangements, P. Boehnert will make a written request of RES for this material).

BACKGROUND MATERIAL PROVIDED THE SUBCOMMITTEE FOR THIS MEETING

1. Package of reports from ACRS Consultants concerning a series of NRC/W meetings on the W AP600 T/H certification programs; to wit:

- Reports of ACRS Consultants "V.J." Dhir and V. Schrock - December 9-10, 1992 NRC/W meeting on AP600 integral systems test programs
- Reports of ACRS Consultants "V.J." Dhir and W. Wulff - February 25, 1993 NRC/W meeting on AP600 CMT test program
- Reports of ACRS Consultants "V.J." Dhir and V. Schrock - May 26-27, 1993 NRC/W meeting on AP600 ADS test program

2. Memorandum, N.J. Liparulo, W, to P. Boehnert, dated June 28, 1993, transmitting background material in preparation of subject ACRS Subcommittee Meeting.

3. Memorandum from I. Catton to ACRS Members, dated May 31, 1993: "Trip Report - Visit to Italian Test Facilities Used in Support of AP600 and SBWR Design Certification Programs" (**Report May Contain Proprietary Information**)

4. Report, OSU-NE-9204: "Scaling Analysis for the OSU AP600 Integral System and Long Term Cooling Test Facility", (DRAFT, Rev. 2), dated November, 1992 (**Westinghouse Proprietary**)

5. SIET Memorandum, dated November 12, 1992, transmitting report "SPES-2 Scaling Up-Date" (DRAFT) (**Westinghouse Proprietary**)

6. Memorandum to I. Catton, et. al., from M. Stella, ACRS Senior Fellow, "Review of ROSA-V Gravity Injection Test Results and Related Analyses", dated July 19, 1993

Note: Additional meeting details can be obtained from a transcript of this meeting available in the NRC Public Document Room, 2120 L St., NW, Washington DC 20006, (202) 634-3273, or can be purchased from Ann Riley and Associates, Ltd., 1612 K St., NW, Suite 300, Washington, DC 20006, (202) 293-3950