



GE Nuclear Energy

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Docket STN 52-004

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U. S. Nuclear Regulatory Commission
Washington DC 20555

Attention: Paul A. Boehnert
Advisory Committee on Reactor Safeguards (ACRS)

**Subject: Response to Open Items from the August 24, 1994, ACRS
"Subcommittee Meeting on Thermal Hydraulic Phenomena"**

References: 1. Official Transcript of Proceedings, Wednesday,
August 24, 1994, Ann Riley & Associates, Ltd.

The enclosure to this letter contains responses to open items from the referenced
ACRS Subcommittee meeting.

Sincerely,

J. E. Leatherman, Acting Manager
Advanced Plant Technologies

Enclosures: Responses to Open Items from the August 24, 1994 ACRS
Thermal Hydraulic Subcommittee Meeting.

cc: W. R. Borchardt (NRC)
R. W. Hasselberg (NRC)
M. Malloy (NRC)

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SBWR

**OPEN ITEMS FROM TRANSCRIPT OF THE ACRS THERMOHYDRAULIC
SUBCOMMITTEE MEETING AUGUST 24, 1994**

Open Item 11/1 Provide a list of members of the external technology review committee.

GE Response 11/1 Members of External Review Team:

Name	Affiliation
Trevor Cook, Chair	DOE
Richard Camp (UESC)	DOE
Thomas Miller (UESC)	DOE
Carter Savage (JUPITER)	DOE
S. Levy (SLI)	EPRI
R. Burke	EPRI
R. T. Fernandez	EPRI
W. Layman	EPRI
M. Merilo	EPRI
P. Coddington	PSI
G. E. Dix	GE
S. S. Duza	GE

Open Item 62, 63, 64 Will there be PANDA tests simulating Vacuum Breakers malfunction?

GE Response 62, 63, 64 Tests of vacuum breaker leakage in excess of tech spec limits have been included in PANDA (See NEDO-32391, TAPD Appendix A, Test M8).

Open Item 73, 74 Where has GE addressed the PANDA test initial conditions, that is beginning with the transient already underway ("catch it on the fly")?

GE Response 73, 74 This issue was addressed in the GE response to RAI 900.74 transmitted to NRC by MFN No. 113-94, dated September 26, 1994.

Open Item 76/5	Clarify whether or not noncondensibles will be injected into the drywell during the PANDA tests.
GE Response 76/5	Noncondensibles will not be injected into the drywell during the PANDA tests.
Open Item 85/16	How can ACRS review the ABWR one-sixth scale boron mixing test report?
GE Response 85/16	The ABWR one-sixth scale boron mixing test report is available for review at GE.
Open Item 121/4	Provide your plans for taking samples and determining nitrogen concentrations to confirm mixing and nitrogen feed to the PCC at PANDA.
GE Response 121/4	Oxygen sensors have been added to the PANDA test facility to measure noncondensable fraction in the drywell near the PCC inlets.
Open Item 145/14	Explain why calibration tests were not performed for heat loss for the GIST Test Facility.
GE Response 145/14	Heat loss tests were not formally conducted for GIST because the effect of the heat loss on the system performance was expected to be negligible. This was confirmed with TRACG sensitivity studies by varying the heat losses from one half to double the expected values. Heat losses were approximated from test data by analysis of the heat required to maintain constant conditions prior to test initiation. The results from that analysis agreed well with the TRACG calculated results and were reported in Section 2.4 of "Response to NRC Findings on GIST", submitted by MFN No. 235-93 on December 16, 1993.
Open Item 151/8, 18	Where has GE provided a study scaling the momentum equation?
GE Response 151/8, 18	Scaling of the momentum equation was provided in response to RAI 900.69 in MFN 113.94 dated 9/26/94.
Open Item 163/13	How can ACRS review the SBWR(ABWR) loads definition document analogous to those GE did for Mks I, II, and III containments?

GE Response 163/13

The SBWR(ABWR) Loads Definition report is available for review at GE in San Jose.

Open Item 165, 166

Provide the details of the RWCU isolation valves, the analysis that shows that these valves will close against the full flow if the RWCU line ruptures, and the analysis showing that the room(s) in which the RWCU break could occur can accommodate the pressure buildup. Provide analysis that shows that the issue(s) raised by the ACRS for the ABWR regarding loads on structures (redesigned walls/doors and/or equipment qualification in the case of ABWR) due to a RWCU line break has/have been resolved for SBWR.

GE Response 165, 166

Analyses for the postulated rupture of the 8 inch pipe in the non-safety-grade portion of the RWCU system housed inside the secondary containment will be performed following the restart of the SBWR Design Review.

These analyses will include:

- PRA evaluations
- Subcompartment pressurization evaluations
- Determination of Environmental qualification requirements for Emergency Core Cooling System equipment and instrumentation
- RWCU line isolation valve analysis for pressure loads due to a RWCU line break outside the primary containment.

Open Item 170/25

Where has GE provided a report summarizing past operating experience with ICs, particularly those pertaining to waterhammer during startup and/or operation?

GE Response 170/25

A summary of past operating experience with ICs is contained in the response to RAI 440.6, transmitted to the NRC by MFN 089-94, dated 8/2/94.

Some additional water hammer incidents are listed below.

At Millstone 1 on 3/11/78 the isolation system was damaged by a water hammer caused by "water entrainment in steam lines". Reference NUREG-0582 1979, Water Hammer in Nuclear Power Plants".

At Oyster Creek on 12/11/71 an IC pipe failed due to water hammer. Reference "Water Hammers in BWRs", Bush S. H., December 1981, Battelle, Pacific Northwest Laboratory.

At Nine Mile Point 1 water hammer occurred on 10/12/69. No damage was sustained but a check valve was removed.

At Millstone 1 water hammer occurred on 2/12/76 and the condenser was damaged. Repair was required.

At Millstone 1 water hammer occurred on 3/11/78 and "sway arrestors" were added..

At Millstone 1 water hammer occurred on 12/19/79, but no damage was sustained.

At Oyster Creek water hammer occurred on 12/11/71 with attendant vent line failure. The vent line was repaired.

Reference EPRI NP-6766 Volume 1 July 1992, "Water Hammer Prevention, Mitigation, and Accommodation".

Nine Mile Point 1 and Tsuruga experienced "severe" water hammers due to failure to drain steam supply lines. Addition of drain lines eliminated the problem.

Of the instances of water hammer identified in the isolation condenser system, the last documented event occurred in 1979, so apparently the problem has been solved by correct pipe drainage.

Open Item 174/20	Provide copies of the two heat transfer test reports, one by UC and the other by Bill Usry (GE).
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GE Response 174/20	Copies of the heat transfer test report "Single Tube Condensation Test Program" were transmitted to NRC by MFN No. 023-94 on March 2, 1994 and a copy of this report is enclosed. A copy of the second report was sent to NRC and ACRS by MFN No. 105-94 on September 6, 1994.
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