August 10, 1982

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
THE CLEVELAND ELECTRIC	)	Docket Nos. 50-440
ILLUMINATING COMPANY, et al.	)	50-441
	)	
(Perry Nuclear Power Plant,	)	
Units 1 and 2)	)	

APPLICANTS' ANSWER TO SUNFLOWER ALLIANCE, INC. ET AL. REQUEST TO APPLICANTS AND STAFF FOR ADMISSIONS CONCERNING ISSUE #4

Applicants for their answers to Sunflower Alliance, Inc. et al. Request To Applicants and Staff For Admissions Concerning Issue #4, dated July 21, 1982, state as follows:

RESPONSES

1. The ECCS evaluation model for the Perry Nuclear Power Plant has as a fundamental assumption the adequacy of core spray flow and core spray distribution for the LOCA spectrum considered.

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Response:

Denied. The ECCS evaluation model uses the core spray flow as an input item. The adequacy of the core spray distribution is not part of the ECCS evaluation model.

2. Experimental data from both the European tests which led to the development of unresolved safety issue A-16 and recent tests in Japan indicate that core spray flow and core spray distribution may be inadequate in BWRs.

Response:

Neither admitted nor denied. The European and Japanese tests were conducted with spray nozzles and system configurations different from those used in the core spray system installed in Perry Nuclear Power Plant ("PNPP"), and, therefore, do not indicate that core spray flow and core spray distribution are inadequate for PNPP. Applicants object to the request for admission on the ground of relevancy insofar as it relates to BWR's other than PNPP. See 10 C.F.R. §§ 2.740(b)(1) and 2.742(b)(2).

3. Appendix K to 10 CFR Part 50 mandates confirmation of ECCS evaluation models with appropriate experimental data.

Response:

Denied. 10 C.F.R. Part 50, Appendix K, Section II, Paragraph 4 states: "To the extent practicable, predictions of the evaluation model, or portions thereof, shall be compared with applicable experimental information."

4. BWR ECCS core spray distribution is influenced by a variety of factors, including system pressure, temperature, and steam flow rate, and may involve core-wide phenomena such as vortex, swirling, redistribution, and 2-phase froth buildup.

Response:

Admitted as to system pressure, temperature, steam flow rate and redistribution. Although core spray distribution is influenced by system pressure, temperature and steam flow rate, and may involve multiple nozzle interaction redistribution, the BWR/6 core spray system is designed for operation in a steam environment within the required ranges of pressure, temperature, steam flow rate, and multiple nozzle interaction redistribution.

Denied as to vortex and swirling. These phenomena have been investigated in full size flow tests and found not to affect core spray distribution for the BWR/6 core spray system.

Neither admitted nor denied for two-phase froth buildup. Although ECCS core spray distribution may involve two-phase froth buildup, in those instances where there is two-phase froth build-up, sufficient cooling will be available to all bundles, thereby eliminating the need for core spray distribution.

5. Core-wide phenomena such as vortex, swirling, redistribution, and 2-phase froth buildup would not be discovered without actual full-scale, multi-nozzle experiments in steam at pressures typical of those present in the BWR upper plenum following a LOCA.

Response:

Denied. Tests have been conducted which would "discover" these phenomena to the extent that they exist. Actual full-scale, multi-nozzle tests in steam at pressures typical of those present in the BWR upper plenum following LOCA are not necessary to determine whether these phenomena would exist under such conditions. Vortex, swirling and multiple nozzle interaction redistribution are all hydrodynamic phenomena, and, as such, have been investigated in full size flow tests. As stated in Response #4, supra, vortex and swirling do not affect the BWR/6 core spray system, and multiple nozzle interaction redistribution is incorporated in the design. Two-phase froth buildup has been investigated in a number of different types of tests, including 30° sector steam tests.

6. The 30° sector steam test methodology as described in NEDO-24712 cannot duplicate actual conditions present in the core following a LOCA and thus cannot provide experimental data on core-wide phenomena such as vortex, swirling, redistribution, and 2-phase froth buildup.

Response:

Neither admitted nor denied. Although the 30° sector steam tests are not intended to "duplicate" actual conditions present in the core following a LOCA, the tests confirm the core spray design methodology. As stated in Responses #4 and #5, supra, the methodology deals with actual conditions for a steam environment, including, to whatever extent applicable, vortex, swirling and multiple nozzle interaction redistribution. As also stated, vortex and swirling do not affect core spray distribution for the BWR/6 core spray system, and two-phase froth buildup eliminates the need for core spray distribution. Because the 30° sector steam tests confirm the core spray design methodology, they provide experimental data as to these phenomena.

7. The 30° sector steam test methodology as described in NEDO-24712 cannot represent realistic core conditions because spray distribution in the center 2 feet of the core is affected by both sector size and the influence of the sector walls.

Response:

Neither admitted nor denied. Although the 30° sector steam tests are not intended to "represent" spray distribution in the center two feet of the core, the tests confirm the core spray design methodology. The methodology correctly handles the thermodynamic and hydrodynamic phenomenon affecting core spray distribution in a steam environment, and deals with spray distribution in the center two feet of the core.

8. Since the center core region is farthest from the spray nozzles, this region would be the most adversely affected by steam pressure effects on core spray distribution.

Response:

Neither admitted nor denied. The BWR/6 core spray system is designed for operation in a steam environment within the required ranges of pressure. Different nozzle types and nozzle orientations are used specifically to cover various regions of the core, including the center region.

9. Because the test facility cannot simulate steam flow in the bypass region, the 30° sector steam test methodology as described in NEDO-24712 cannot produce meaningful data for steam flow rates exceeding 20,000 lb/hr.

Response:

Denied. The lack of bypass region steam flow in the 30° sector steam tests allows spray drops to fall more easily into the bypass than into the bundles. As a result, the measured redistribution in the bundles is slightly lower than would be the case if bypass region steam flow were included. This is a "meaningful" result in that it provides conservative experimental data for the design range of steam flow rates.

10. Steam flow rates exceeding 20,000 lb/hr are encountered during accident conditions.

Response:

Neither admitted nor denied. Although steam flow rates exceeding 20,000 lbs/hr are encountered during many accident conditions, they are not encountered during all accident conditions. A steam flow rate exceeding 20,000 lbs/hour provides adequate core cooling in and of itself, and, therefore, core spray distribution would not be needed.

11. The 30° sector steam test methodology as described in NEDO-24712 has not adequately investigated the variation of core spray distribution with pressure due to the limited range of pressures tested (29.5 psia, 44.1 psia, and 73.5 psia).

Response:

Denied. The BWR/6 core spray system is designed for operation in a steam environment within a range of pressure not exceeding 73.5 psia. The 30° sector steam tests confirm the methodology for application of the core spray system over the applicable range of pressure. See Response #12, infra.

12. Pressures far in excess of the highest pressure tested (73.5 psia) are encountered during accident conditions.

Response:

Neither admitted nor denied. Although pressures in excess of 73.5 psia are encountered during some accident conditions, they are not encountered during all accident conditions. As noted in Response #11, the BWR/6 core spray system is not designed for pressures in excess of 73.5 psia. Core spray distribution is not needed above 73.5 psia because at such high pressures there will be two-phase froth buildup. As stated in Response #4, such two-phase froth buildup will insure that sufficient cooling will be available to all bundles.

13. The 30° sector steam test methodology as described in NEDO-24712 cannot investigate any possible effects on core spray distribution due to non-condensible gases or to varying gas temperatures.

Response:

Admitted as to noncondensible gases. Although the 30° sector steam tests are not intended to investigate the effects on core spray distribution from noncondensible gases, the effects of noncondensible gases have been investigated in full size flow tests.

Admitted as to varying gas temperatures. The varying gas temperatures that may be encountered during accident conditions will not affect core spray distribution. The 30° sector steam tests, therefore, are not intended to investigate the effects of varying gas temperatures on core spray distribution.

14. Non-condensible gases and widely varying gas temperatures may be present during accident conditions.

Response:

Neither admitted nor denied as to noncondensible gases. Although noncondensible gases may be present in the later stages of certain accident conditions, they are not present in the early time period for which core spray distribution in a steam environment would be required.

Denied for widely varying gas temperatures. Widely varying gas temperatures would not be encountered during accident conditions.

15. The results obtained from the 30° sector steam test as described in NEDO-24712 have not been applied to each different reactor size and design for which the full-reactor-core, post-LOCA spray distribution is to be determined (as required by the February 3, 1978 letter from Eisenhut and Ross, NRC, to G. Sherwood, GE).

Response:

Denied. The results obtained from the 30° sector steam tests were used to confirm the core spray design methodology for the BWR/6 core spray system. This methodology has been applied to all BWR/6 systems, including the 238 size installed in PNPP. The 30° sector steam tests tested the type of spray nozzles and spray system configurations installed in PNPP.

16. Due to a severe funding shortage for the SSTF program, the application/evaluation described above may never be accomplished.

Response:

Denied. The core spray methodology confirmation tests conducted at the Sector Steam Test Facility were completed in 1979. As stated in Response #15, the application of the methodology to each BWR/6 size was completed at that time. There was no "severe funding shortage" for these core spray methodology confirmation tests.

17. Points of concern identitied at p. 5 of the NRC's Topical Report Evaluation for NEDO-24712, pertaining to the large uncertainty bands on the SSTF data and variation with steam flow and pressure, have not been resolved.

Response:

Denied. The succeeding paragraph in the NRC's Topical Report Evaluation for NEDO-24712 assesses these points and resolves the concerns. The Topical Report Evaluation concludes: "Therefore, the SSTF tests constitute a confirmation of the GE spray distribution design methodology for BWR/6 type spargers."

18. The assumption that thermodynamic and hydrodynamic effects on BWR core spray distribution in steam are separable is based on engineering judgement.

Response:

Denied. The separability of thermodynamic and hydrodynamic effects on BWR core spray distributions in steam is proved by the 30° sector steam tests' confirmation of the core spray design methodology.

19. Acceptance of the 30° sector steam test methodology is based on engineering judgement.

Response:

Neither admitted nor denied. The 30° sector steam tests are intended to provide experimental data on the correctness of the core spray design methodology. The acceptability of the tests for this purpose is based on the fact that the tests' results were consistent with the results predicted by the core spray design methodology. The design of the 30° sector steam tests was based on engineering knowledge accumulated in developing the core spray design methodology and conducting other experiments testing that methodology.

Respectfully Submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

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Dated: August 10, 1982

AFFIDAVIT

WILLIAM A. SUTHERLAND, being duly sworn according to law, deposes and says that he is Manager, LOCA Systems Technology of General Electric Company and that the facts set forth in the foregoing Applicants' Answer to Sunflower Alliance Request for Admissions 1 - 19 (Issue #4) dated July 21, 1982, are true and correct to the best of his knowledge, information and belief.

Wm C. Sutherland

STATE OF CALIFORNIA)
ss:
COUNTY OF SANTA CLARA)

On August 9, 1982, before the undersigned, a Notary Public for the State of California, personally appeared WILLIAM A. SUTHERLAND, known to me to be the person whose name is subscribed to the within instrument, and acknowledged that he has executed the same.

Subscribed and sworn to before me on August 9, 1982.

OFFICIAL SEAL
KAREN S. VOGELHUBER
NOTARY PUBLIC - CALIFORNIA
SANTA CLARA COUNTY
My Commission Expires Dec. 21, 1984

Karen S. Vogelhuber
Notary Public, State of California

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CERTIFICATE OF SERVICE

This is to certify that copies of the foregoing "Applicants' Answer To Sunflower Alliance, Inc. et al. Request To Applicants And Staff For Admissions Concerning Issue #4," were served by deposit in the U.S. Mail, First Class, postage prepaid, this 10th day of August, 1982, to all those on the attached Service List.

Robt L. Will

Robert L. Willmore

Dated: August 10, 1982

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