October 12, 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 OHIO CITIZENS FOR RESPONSIBLE ENERGY SIXTH SET OF INTERROGATORIES TO APPLICANTS

Applicants for their answers to Ohio Citizens for Responsible Energy ("OCRE") Sixth Set of Interrogatories to Applicants, dated September 27, 1982, state as follows:

Applicants hereby respond to the interrogatories directed to Issue #4. Applicants' responses to the interrogatories directed to Issue #6 will be filed separately. All documents supplied to OCRE for examination will be produced at Perry Nuclear Power Plant ("PNPP"). Arrangements to examine the documents can be made by contacting Mr. Ronald Wiley of The Cleveland Electric Illuminating Company at (216) 259-3737. Applicants will provide copies of any of the produced

documents, or portions thereof, which OCRE requests, at Applicants' cost of duplication. Arrangements for obtaining copies can be made with Mr. Wiley.

RESPONSES

6-1. Have Applicants considered the effects on core spray distribution and/or flow due to the thermal properties of hydrogen (high specific heat and thermal conductivity) which might be present following a LOCA? If so, provide all such analyses. If not, why not?

Response:

The effects of noncondensible gases have been investigated in full size flow tests conducted in an air environment. The thermal properties of hydrogen (high specific heat and thermal conductivity) do not affect the noncondensible gas effect on core spray distribution and/or flow, and, therefore, are not a factor in the core spray design methodology.

6-2. In the December 11, 1981 memorandum for the Shoreham ASLB from R. Tedesco, Division of Licensing, concerning Japanese core spray distribution tests, it is stated that "(t)here is some possibility that the new data contradict conclusions from 360° air-water tests in the U.S. for a BWR/6 configuration." Do Applicants agree? Why or why not?

Response:

Applicants do not agree. As stated in the referenced memorandum: "The Japanese tests are designed to simulate a BWR/5." The spray nozzles and system configurations used in the core spray system installed in PNPP are substantially different from a BWR/5. The 360° air-water tests provide spray interaction information for each specific BWR design. The core spray design methodology for obtaining and utilizing the spray interaction information from air-water tests was confirmed by the 30° sector steam tests and approved by the NRC in a letter from R. L. Tedesco to G. G. Sherwood, dated January 30, 1981. This letter already has been supplied to OCRE.

6-3. Is it not true that the only way in which the adequacy of BWR ECCS core spray flow and/or distribution will be known with certainty is to conduct tests on a large, operating reactor in a situation where there is a true demand on the ECCS (i.e., an actual accident)? Explain why this is or is not true.

Response:

It is not true. The core spray design methodology deals with actual conditions for a steam environment and correctly handles the thermodynamic and hydrodynamic phenomenon affecting core spray distribution in a steam environment. The 30° sector steam tests provide experimental data as to these phenomena and confirm the core spray design methodology.

6-4. Explain how "two-phase froth buildup eliminates the need for core spray distribution" (Response to Request for Admission 6). Is two-phase froth buildup the same as the Counter-Current Flow Limiting (CCFL) phenomenon?

Response:

Core spray distribution refers to the distribution of liquid across the top of the core, characterized by liquid drops moving through vapor. Two-phase froth buildup refers to a liquid continuous flow regime, which is characterized by steam bubbles in a continuous pool of liquid that extends across the top of the core. This continuous pool provides liquid at the top of each bundle, thereby obviating the need for core spray distribution. Two-phase froth buildup is a consequence of the CCFL phenomena, which determines how much of the available liquid enters a fuel bundle from the continuous pool.

6-5. Define the design range of steam flow rates for the ECCS core spray systems (see Response to Request for Admission 9).

Response:

The design range of steam flow rate for ECCS core spray distribution covers zero updraft to balanced updraft/downdraft, as described in NEDO-24712. For higher core steam flows, the upper plenum flow regime would be dominated by

CCFL effects, and core cooling would result from the flowing steam.

6-6. Explain the apparent discrepancy between the Response to Request for Admission 11, in which it is stated that the BWR/6 core spray system is not designed to operate in pressures exceeding 73.5 psia, and FSAR Table 6.3-1, which states that, for the LPCS, flow may commence at 289 psid (vessel to drywell) and reaches 6000 gpm at 122 psid, and for the HPCS, flow may commence at 1177 psid (vessel to pump suction) and reaches 6000 gpm at 200 psid.

Response:

There is no discrepancy between Applicants' Response to Request for Admission #11 and FSAR Table 6.3-1. The core spray systems provide two functions. First, the flow of core spray water replaces water inventory by refilling the system and reflooding the core. The flows and system pressure for this function are described in FSAR Table 6.3-1. Secondly, the core spray spargers distribute this flow over the top of the core to supply liquid to every fuel bundle. The pressure range for the distribution is described in Applicants' Response to Request for Admission #11. At pressures above 73.5 psia, core spray distribution would not be needed because two-phase froth buildup will provide sufficient cooling to all bundles.

6-7. Produce the following documents:

(a) Letter and attachments, MFN 093-78, A.J. Levine to Darrell G. Eisenhut, "Core Spray Distribution Program, March 1, 1978.

(b) APED-5529, "Core Spray and Core Flooding Heat Transfer Effectiveness in a Full-Scale Boiling Water Reactor Bundle," June 1978.

Response:

The requested documents will be supplied for examination at PNPP.

6-8. Assuming that the SLCS is actuated and borated water is injected through the HPCS sparger, would the presence of boron in the spray affect the core spray flow and/or distribution? Provide documentation supporting the answer.

Response:

The SLCS would only be actuated for the very remote situation in which boron would be required for reactivity control. The specific gravity of the borated solution in the SLCS is approximately three percent greater than pure water. This borated solution mixes with the water injected by the HPCS in a ratio of one part SLCS injection for over fifty parts water. Therefore, borated water injected through the HPCS

sparger essentially has the same properties as unborated water, and any affects on flow or distribution would be insignificant.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

By: _____

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Robert L. Willmore

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Dated: October 12, 1982

AFFIDAVIT

STATE OF CALIFORNIA)
SS:
COUNTY OF SANTA CLARA)

WILLIAM A. SUTHERLAND, being duly sworn, 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 Ohio Citizens for Responsible Energy Interrogatories 6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, and 6-8 (Issue #4), dated September 27, 1982, are true and correct to the best of his knowledge, information and belief.

William A. Sutherland

Subscribed and sworn to before me on this 6th day of October, 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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(Perry Nuclear Power Plant,	)	
Units 1 and 2)	)	

CERTIFICATE OF SERVICE

This is to certify that copies of the foregoing "Applicants' Answer to Ohio Citizens For Responsible Energy Sixth Set of Interrogatories to Applicants," were served by deposit in the U.S. Mail, First Class, postage prepaid, this 12th day of October, 1982, to all those on the attached Service List.

Robert L. Willmore

Dated: October 12, 1982

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NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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THE CLEVELAND ELECTRIC ILLUMINATING COMPANY	)	Docket Nos. 50-440 50-441
	)	
(Perry Nuclear Power Plant, Units 1 and 2)	)	

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