February 25, 1983

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
INTERROGATORIES 9-26 THROUGH 9-37
RELATING TO ISSUE NO. 14

Applicants for their answers to Ohio Citizens for Responsible Energy ("OCRE") Interrogatories 9-26 through 9-37 from OCRE'S Ninth Set of Interrogatories to Applicants, dated January 31, 1983, state as follows:

All documents supplied to OCRE for inspection will be produced at Perry Nuclear Power Plant ("PNPP"). Arrangements to examine the documents, including all necessary protective agreement arrangements, can be made by contacting Mr. Alan Jones 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. Jones.

On February 23 and 25, 1983, Applicants' counsel conferred by telephone with Ms. Susan Hiatt, OCRE's representative, concerning Applicants' objections, as set forth herein. No agreement between Applicants' counsel and Ms. Hiatt was reached as to the scope of Issue No. 14.

9-26. Identify and produce all documents in the possession of Applicants or any of their agents pertaining to the use of in-core or core-exit thermocouples in boiling water reactors.

Response:

Issue No. 14 addresses "in-core" thermocouples and not "core exit" thermocouples.1/ To the extent Interrogatory #9-26 seeks information concerning core-exit thermocouples the Interrogatory is irrelevant and beyond the scope of Issue No. 14. See 10 C.F.R. §2.740(b)(1). Applicants therefore object

---

1/ Issue No. 14 states:

> "Applicant has not demonstrated that the Perry Nuclear Power Plant will meet regulatory safety requirements unless it installs in-core thermocouples, as suggested by staff regulatory guidelines, including Regulatory Guide 1.97, Revision 2."

Memorandum and Order (Concerning Ohio Citizens for Responsible Energy's Late-Filed Contentions 21-26), October 29, 1982, at 15 (emphasis added).

to answering the portion of the Interrogatory that addresses core-exit thermocouples.

The documents requested include the following:

1. Report by S. Levy, Inc. entitled "Analysis of Diverse Liquid Level Monitors In Boiling Water Reactors" (SLI-8117, October 1981).

2. Report by General Electric Co. entitled "General Electric Evaluation Of The Need For BWR Core Thermocouples," (November 16, 1981).

3. Proprietary report by S. Levy, Inc. entitled "Thermal Analyses Of In-Core Thermocouples In Boiling Water Reactors" (SLI-8121, December 1981) (included as Appendix B in item 5 below).

4. Excerpts of proprietary report entitled "BWR Owners Group - Position On NRC Regulatory Guide 1.97, Revision 2" (July 1982).

5. Proprietary report by S. Levy, Inc. entitled "Inadequate Core Cooling Detection in Boiling Water Reactors" (SLI-8218, November 1982).

6. Proprietary report by S. Levy, Inc. entitled "Review of BWR Reactor Vessel Water Level Measurement Systems" (SLI-8211, July 1982).

7. Letter, R. Tanney and R. Pender to P. Gudikunst, dated September 14, 1982.

8. Letter, R. McCarty, S. Gresdo and P. Gudikunst to J. Bellack, dated November 1, 1982.

9. Letter, R. Tanney and J. Bellack to P. Gudikunst, dated November 17, 1982.

10. Letter (with attachments), M. Edelman to B. Youngblood, dated January 14, 1983.

Copies of documents 1, 2 and 7-10 will be supplied for examination at PNPP. Counsel for Applicants will transmit under separate cover to OCRE's representative a protective

agreement covering documents 3-6. Upon completion of the protective agreement, documents 3-6 will be supplied for examination at PNPP.

9-27. Identify all documents Applicants intend to present as evidence or use in cross-examination of Intervenor and/or NRC Staff witnesses on Issue #14. Produce any such documents not identified in the response to the previous interrogatory.

Response:

Applicants have not yet identified the documents to be presented as part of Applicants' direct case on Issue No. 14 or as part of Applicants' cross-examination of other potential witnesses.

9-28. Identify all persons Applicants intend to call as witnesses on Issue #14.

(a) For each person so identified, state the person's address, title, employer, and educational and professional qualifications.

(b) State the subject matter, including the substance of facts and opinions, on which each such person is expected to testify. Identify and produce any documents to be relied upon by each such person in his/her testimony.

Response:

Applicants have not yet identified the individual(s) Applicants intend to call as witnesses on Issue No. 14.

9-29. State every reason, including bases, why Applicants oppose the use of in-core or core-exit thermocouples at PNPP as an indication of inadequate core cooling.

Response:

The subject of core-exit thermocouples, as raised by Interrogatory #9-29, is irrelevant and beyond the scope of Issue No. 14. See 10 C.F.R. §2.740(b)(1); Response to Interrogatory #9-26, supra. Applicants therefore object to answering the portion of the Interrogatory that addresses core-exit thermocouples.

Applicants' opposition to the use of in-core thermocouples at PNPP as an indication of inadequate core cooling (ICC) is premised on the deficiencies inherent in the use of such devices, as described in Section 5.6 and Appendix B of "Inadequate Core Cooling Detection In Boiling Water Reactors," (SLI-8218, November 1982), a copy of which is being provided pursuant to Interrogatory #9-26. Further, Section 3 of SLI-8218 demonstrates that existing BWR water level instrumentation systems, such as those utilized at PNPP, provide adequate, reliable indications of the approach, existence and return from ICC. See Response to Interrogatory #9-35, infra.

9-30. State every reason, including bases, why Applicants oppose the use of in-core or core-exit thermocouples at PNPP as a redundant and diverse indication of reactor vessel water level.

Response:

The subject of core-exit thermocouples, as raised by Interrogatory #9-30, is irrelevant and beyond the scope of

Issue No. 14. See 10 C.F.R. §2.740(b)(1); Responses to Interrogatory #'s 9-26 and 9-29, supra. Applicants therefore object to answering the portion of the Interrogatory that addresses core-exit thermocouples.

Applicants oppose the use of in-core thermocouples to provide indications of water level for the purpose of monitoring core cooling, as suggested by Regulatory Guide 1.97, Rev. 2, Table 1. Applicants recognize that water level is a reliable indicator of core cooling conditions. See SLI-8218, Section 3. However, for the reasons set forth in Sections 5.6 and Appendix B of SLI-8218, Applicants do not believe that in-core thermocouples could be counted on to accurately indicate core water level conditions, and thus core cooling, for all potential off-normal conditions. Even assuming that in-core thermocouples could be used to accurately reflect reactor vessel water level conditions, there has been no showing of a need to supplement current BWR water level measurement systems with alternative ICC detection systems. See Response to Interrogatory #9-35, infra.

9-31. Have Applicants at any time developed any plans or designs (including draft or preliminary plans) for using in-core or core-exit thermocouples at PNPP? If so, produce all such plans and any supporting or related documentation.

Response:

Applicants object to the portion of Interrogatory #9-31 that addresses core-exit thermocouples as irrelevant and beyond the scope of Issue No. 14. See 10 C.F.R. §2.740(b)(1); Responses to Interrogatory #'s 9-26, 9-29, and 9-30, supra.

Applicants have not at any time developed any plans or designs, or draft plans, for using in-core thermocouples at PNPP.

9-32. Do Applicants believe that the incorporation of in-core or core-exit thermocouples at PNPP could provide information useful for detecting propagating core damage? Explain why or why not, and include the bases for your answer.

Response:

Applicants object to the portion of Interrogatory #9-32 that asks about core-exit thermocouples as irrelevant and beyond the scope of Issue No. 14. See 10 C.F.R. §2.740(b)(1); Responses to Interrogatory #'s 9-26, 9-29, 9-30 and 9-31, supra.

Applicants do not believe that the incorporation of in-core thermocouples at PNPP could provide information useful for detecting propagating core damage. Applicants do not expect propagation of core damage to occur, since water within the core would prevent propagation of an uncooled or overheated region. See SLI-8218, Section 3.5. Further, existing plant instrumentation, such as main steam radiation monitors and

off-gas monitors, will respond to cladding failures resulting from local overheating, thus assuring shutdown of the reactor prior to propagation. In the unlikely event of core damage propagation, in-core thermocouples (even if installed as recommended under Regulatory Guide 1.97, Rev. 2) would not likely be near any given fuel bundle. Regulatory Guide 1.97, Rev. 2, recommends installation of only four thermocouples per core quadrant. There are over 700 channels containing fuel. To detect propagation from one channel to another would require a minimum of one thermocouple per channel, or a total of over 700 in-core thermocouples. The installation of such a large number of thermocouples would not be physically possible without significant redesign of current reactor internals. Even if such a quantity of in-core thermocouples could be physically inserted into a redesigned core, the core thermal hydraulics would be degraded.

Finally, in the unlikely event of propagation, even if a thermocouple did happen to be near fuel bundles in a damaged core region it is not likely that local instruments and cables could survive the extreme accident environment postulated. See SLI-8218, Sections 3.6 - 3.7.

9-33. Do Applicants believe that the incorporation of in-core or core-exit thermocouples could provide useful, unambiguous and definitive information following a loss of water inventory with no normal, emergency, or alternative makeup systems available to replenish coolant inventory? Explain why or why not, and include the bases for your answer.

Response:

Applicants object to the portion of the Interrogagory that addresses core-exit thermocouples as irrelevant and beyond the scope of Issue No. 14. See 10 C.F.R. §2.740(b)(1); Responses to Interrogatory #'s 9-26, 9-29, 9-30, 9-31 and 9-32, supra.

The answer to Interrogatory #9-33, insofar as it addresses in-core thermocouples, is "no." First, Applicants' emergency core cooling systems are safety-grade systems and are designed to meet single failure criteria. For this reason, the postulated condition of no makeup water is not credible. Even assuming that such a condition were to occur, the PNPP water level system is capable of monitoring the postulated loss of water inventory and failure to replenish inventory, and the resulting ICC conditions. There would also be other indications of the postulated accident conditions available to the operator, such as lack of feedwater flow, lack of high pressure coolant injection, lack of high pressure core spray, and lack of control rod drive cooling flow. Together, these would indicate to the operator conditions that could lead to ICC. Thus, the postulated conditions would be readily apparent to plant operators without the addition of alternative ICC detection systems. Furthermore, if the postulated condition persisted, core heatup would be extreme and in-core thermocouples would be of no use since they would likely be destroyed as a result of the extreme environmental conditions that would occur.

9-34. Provide a cost estimate for installing in-core thermocouples at PNPP (assuming 4 thermocouples per quadrant, as recommended in Regulatory Guide 1.97). Provide the bases for the estimate.

Response:

The cost of installing in-core thermocouples has not been estimated for PNPP. However, generic preliminary estimates for installing four in-core thermocouples per quadrant in a BWR core was prepared by S. Levy, Inc. See SLI-8218, Appendix B, Section IX. This study concluded that if installation took place before fuel loading, the cost would be on the order of $2,000,000. The bases for this estimate are set out in the cited study.

9-35. Describe in detail the vessel level monitoring capabilities and instrumentation at PNPP and explain why Applicants believe these are sufficient.

Response:

Reactor vessel water level at PNPP is measured by differential pressure transmitters which measure the differences in static head between two columns of water. One column is a cold (ambient temperature) reference leg outside the reactor vessel; the other is the reactor water inside the reactor vessel. The measured differential pressure is a function of reactor vessel level.

The cold reference leg is filled and maintained full of condensate by a condensing chamber at its top which

continuously condenses reactor steam and drains excess condensate back to the reactor vessel through the upper vessel level tap connection to the condensing chamber. The upper vessel level tap connection is located in the steam zone above the normal water level inside the vessel. Thus the reference leg presents a constant reference static head of water to the high pressure tap on the differential pressure transmitter. The low-pressure tap of the transmitter is piped to a lower-level tap on the reactor vessel which is located in the water zone below the normal water level in the vessel. The low-pressure side of the transmitter thus senses the static head of water/steam inside the vessel above the lower vessel level tap. This head varies as a function of reactor water level above the tap and is the "variable leg" in the differential pressure measured by the transmitter. Lower taps for various instruments are located at various levels in the vessel water zone to accommodate both narrow- and wide-range level measurements.

Multiple reactor vessel water level transmitters are utilized at PNPP for providing signals to analog trip units for actuation of safety-related systems. Four redundant sets of level transmitters are included in PNPP's design with each set consisting of a wide and narrow range set of instruments. The wide range instruments cover a span of over 19 feet; the narrow range instruments cover a span of over six feet. A total of 25 transmitters are connected to analog trip units that cause

various plant system trips at specific vessel levels. The plant systems typically controlled or automatically initiated by the transmitter outputs are: (1) Reactor Protection System; (2) High Pressure Coolant System; (3) Isolation Systems; (4) Low Pressure Coolant Systems including the Automatic Depressurization System; (5) Feedwater Control System; and (6) Recirculation System.

Level instrumentation included at PNPP also consists of multiple water level indications displayed in the control room. There are 32 remote mounted differential pressure transmitters which transmit signals to indicators, level indicating switches, or recorders. To ensure complete and accurate coverage of actual and postulated conditions of vessel water level, several ranges of level indication are provided with a total of nine channels of indication.

Applicants have evaluated the PNPP water level instrumentation design against the analyses and conclusions of SLI-8211, "Review of BWR Reactor Vessel Water Level Measurement Systems" (July 1982) (a copy of which is being provided pursuant to Interrogatory #9-26, supra). SLI-8211 concluded that BWR water level measurement systems have demonstrated a high degree of capability to provide required information to operators during normal and off-normal plant operations. SLI-8211 did, however, recommend a number of design modifications to increase further system reliability. In response to

the SLI-8211 recommendations, Applicants have committed to certain PNPP level system piping configuration design modifications, as described in the January 14, 1983 letter from M. Edelman (CEI) to B. Youngblood (NRC), a copy of which is being provided pursuant to Interrogatory #9-26, supra. These modifications will assure that the PNPP water level measurement systems fully meet all applicable recommendations contained in SLI-8211.

The reactor vessel water level systems design described above employs direct measurement instrumentation which results in operational simplicity. The measurement techniques provided at PNPP are expected to perform adequately for all modes of normal operation, anticipated transient conditions and credible accident conditions involving ICC. See SLI-8218, Section 3.

9-36. What capabilities and instrumentation do Applicants intend to use at PNPP to detect inadequate core cooling?

Response:

Applicants intend to use the reactor vessel water level instrumentation at PNPP to detect the approach to, existence of, and recovery from any ICC conditions. The capabilities of this instrumentation to detect ICC are described in SLI-8218, Section 3. See Responses to Interrogatory #'s 9-29 and 9-35, supra.

9-37. It is stated in Section 1.11 of NUREG-0887, the Perry SER, that, as a license condition, a final report analyzing inadequate core cooling instrumentation requirements for TMI Action Plan Item II.F.2 should be submitted by July 1982.

(a) Has this report been submitted yet? If not, state when the report is expected.

(b) Produce this report.

Response:

(a) Yes. Applicants' report pursuant to Section 1.11 of NUREG-0887 consists of two BWR Owners Group Reports, SLI-8211 (July 1982) and SLI-8218 (November 1982), and Applicants' letter, M. Edelman (CEI) to B. Youngblood (NRC), dated January 14, 1983. These have been submitted to the NRC and are listed as items 5, 6 and 10 in Applicants' Response to Interrogatory #9-26, supra.

(b) Copies of these documents will be produced pursuant to Interrogatory #9-26, supra, after completion of appropriate protective agreement arrangements.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

By: Harry H. Glasspiegel
JAY E. SILBERG, P.C.
HARRY H. GLASSPIEGEL

Counsel for Applicants

1800 M Street, N.W.
Washington, D.C. 20036
(202) 822-1000

DATED: February 25, 1983.

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

CLEVELAND, OHIO

Ray V. Tanney, being duly sworn according to law, deposes that he is Associate Engineer, Nuclear Engineering, of The Cleveland Electric Illuminating Company and that the facts set forth in the foregoing "Applicants' Answers to Ohio Citizens for Responsible Energy, Ninth Set of Interrogatories 9-26 through 9-37 relating to Issue No. 14", dated February 25, 1983, are true and correct to the best of his knowledge, information and belief.

Ray V. Tanney

Sworn to and subscribed
before me this 25th day
of February, 1983

Joanne Schmidt

Notary Public
State of Ohio - Lake County
My comm. exp. Nov. 12, 1983

February 25, 1983

'83 FEB 28 P2:13

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY, et al.	)	Docket Nos. 50-440 50-441
	)	
(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 Interrogatories 9-26 through 9-37 Relating to Issue No. 14" were served by deposit in the United States Mail, First Class, postage prepaid, this 25th day of February, 1983, to all those on the attached Service List.

Harry H. Glasspiegel

HARRY H. GLASSPIEGEL

DATED: February 25, 1983

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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

SERVICE LIST

Peter B. Bloch, Chairman
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Jerry R. Kline
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Glenn O. Bright
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Christine N. Kohl, Chairman
Atomic Safety and Licensing
Appeal Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. John H. Buck
Atomic Safety and Licensing
Appeal Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gary J. Edles, Esquire
Atomic Safety and Licensing
Appeal Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Atomic Safety and Licensing
Appeal Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docketing and Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

James M. Cutchin, IV, Esquire
Office of the Executive
Legal Director
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Ms. Sue Hiatt
OCRE Interim Representative
8275 Munson Avenue
Mentor, Ohio 44060

Daniel D. Wilt, Esquire
Post Office Box 08159
Cleveland, Ohio 44108

Donald T. Ezzone, Esquire
Assistant Prosecuting Attorney
Lake County Administration Center
105 Center Street
Painesville, Ohio 44077

John G. Cardinal, Esquire
Prosecuting Attorney
Ashtabula County Courthouse
Jefferson, Ohio 44047

Terry Lodge, Esquire
915 Spitzer Building
Toledo, Ohio 43604