February 5, 1985

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)	)	

AFFIDAVIT OF
ROGER E. LINNEMANN
ON CONTENTION P

County of Philadelphia)
) ss
Commonwealth of Pennsylvania)

Roger E. Linnemann, being duly sworn, deposes and says:

1. I am Vice Chairman and Chief Medical Officer, Radiation Management Corporation ("RMC"), University City Science Center, Philadelphia, Pennsylvania. I am also Clinical Asscciate Professor of Radiology, University of Pennsylvania School of Medicine and Visiting Associate Professor of Clinical Radiology, Northwestern University Medical School. I am licensed to practice medicine and surgery in Pennsylvania, Illinois and Minnesota and am certified by the American Board of Radiology and the American Board of Nuclear Medicine. I have represented the Commonwealth of Pennsylvania in the

Medical Liaison Officer's Network, a national organization of physicians established by the U.S. Environmental Protection Agency and the Department of Defense to consult on radiation problems associated with federal installations. As Chief Medical Officer of RMC, I am responsible for the training which RMC has provided to hospitals in the area surrounding the Perry Nuclear Power Plant. I am also familiar with the capability of hospitals to treat injured individuals who are contaminated with radioactive materials, as well as individuals suffering from radiation exposure. A current statement of my professional qualifications is attached hereto. I have personal knowledge of the matters stated herein and believe them to be true and correct. I make this affidavit in support of Applicants Motion for Summary Disposition of Contention P.

2. Radiation injuries result from either exposure to radiation or contamination by radioactive materials. In the case of radiation exposure, the patient suffers injury from the energy deposited in the cells during the period of radiation, but the patient is not radioactive and presents no hazard to response personnel. Contamination results from loose radioactive particles adhering to the body. An exposure hazard remains until these particles are removed. Radioactive contamination is easy to detect and decontamination is easily accomplished by removing contaminated clothes and bathing the affected area.

3. Should a patient be exposed and injured, no special emergency facilities are needed. The patient can be handled as any other injured patient. If the patient is contaminated, procedures are implemented to reduce exposure and control the spread of any contamination. However, these procedures are not unique to radiation injury cases; similar steps are taken for chemical contamination or septic cases.

4. The characteristics of radiation injury make it one of the easiest medical emergencies to handle. Radiation injuries are seldom if ever immediately life-threatening. The consequences unfold over a period of time with predictable sequence. Therefore, treatment of any life-threatening traumatic injury or serious illness always takes precedence over treatment of the radiation injury. Once the patient is resuscitated and stabilized, he can be decontaminated and placed in a regular hospital bed. There is then time for assessment and treatment of the radiation injury. No special equipment is needed (such as lead-lined operating rooms, radiation resistant equipment, etc.) because of the nature of the radiation exposure and the conditions of treatment. Any contaminated materials would be disposed of following the same procedures used for nuclear medicine departments; no special equipment would be needed to handle this disposal.

5. Even in the extremely unlikely event of an accident at a nuclear plant with substantial off-site release of radiation, there would not be the need for any large number of

hospital beds for an injured population. Such an accident would not involve the generation of large numbers of traumatic casualties. The only way in which an off-site population can be affected is through overexposure to radiation.

6. The characteristics of a radiation release mitigate against the possibility that an individual would receive the level of exposure (about 150,000 millirem over a period of a few hours) which would require hospitalization. Distance, dispersion and absorption of radiation by other materials (by shelter, for example) make it unlikely that anyone off-site would receive a large enough exposure to initiate the first symptoms of radiation sickness (about 75,000 millirem), let alone hospitalization. Given the relative ease of decontamination (changing clothes and bathing), overexposure from contamination is also unlikely. To cause a redness to the skin from fission product radiation would require a total dose of about 800,000 millirem; one would literally have to leave caked radioactive dirt on the skin for hours to deliver these kinds of doses.

7. Based on these considerations, one could reasonably expect that the medical responsibilities of a major nuclear power plant accident would be the treatment of a few injured plant workers who were also contaminated or exposed, and a larger number of the public who might be slightly contaminated. These cases could readily be handled by present medical resources.

8. The emergency plans relating to the Perry Nuclear Power Plant identify Lake County Memorial Hospital East, Lake County Memorial Hospital West, Geauga Community Hospital and Ashtabula County Medical Center as the local hospitals designated to handle members of the general public who may have radiation uptake or exposure. Lake County Plan, § L-03; Ashtabula County Plan, § L.3; Geauga County Plan, § L-2. The Perry Emergency Plan (§ 5.3.3.2) designates Lake County Memorial Hospital East as the hospital to receive highly-contaminated-injured persons from on-site for initial treatment and decontamination. (If Lake County Memorial Hospital East were being evacuated due to an accident at Perry -- it is within the 10 mile EPZ -- these persons would be taken directly to Lake County Memorial Hospital West.) Definitive, long-term care for contaminated injuries and significant radiation overexposure is available through RMC's arrangements with Northwestern Memorial Hospital in Chicago, and the Hospital of the University of Pennsylvania, Philadelphia.

9. RMC has provided extensive training to personnel of both Lake County Memorial Hospitals (East and West), Ashtabula County Medical Center and Geauga Community Hospital. The training program has as its objectives to first insure that immediate emergency medical care is provided to an injured individual and, secondly, to perform appropriate decontamination and contamination control techniques. The topics of the training include the biological effects of

ionizing radiation, personnel protective actions, use of emergency room equipment and supplies for the contaminated patient, contamination control techniques, and decontamination and bioassay procedures. Eighty-five hospital personnel have been trained, including fifteen physicians, fifty-three nurses, eleven nuclear medicine and radiology personnel, and 6 emergency medical technicians.

10. In the event of multiple contaminated and injured personnel, the support hospitals would be able to handle the increased numbers. Since hospitals already have procedures to handle mass casualty situations (for example, a bus accident), these can easily be applied to handle multiple injured contaminated patients. Incoming patients would be triaged on the basis of their injuries, since traumatic injury always takes precedence over contamination. If additional treatment rooms are necessary, the designated Radiation Emergency Area can readily be expanded. However, multiple injuries would be very rare. In my fifteen years experience at twenty-five nuclear power plant sites, only two cases involved multiple injuries -- in each case involving two employees each.

11. In addition to these four hospitals, there are some fifty hospitals in the counties around the 10 mile EPZ which can receive and care for most radiological accident cases. These are listed in the State Plan, Fig. II-L-2. They should be capable of dealing with contaminated and exposed individuals, including those who have been otherwise injured.

Thirty-seven of these hospitals have diagnostic and/or therapeutic radioisotope facilities. This requires that they are able to handle contaminated and injured patients which could result from injuries within their own facilities.

12. The State has indicated that all of the hospitals listed in the State Plan are accredited by the Joint Commission on Accreditation of Hospitals. Standard V of the Commission's Accreditation Manual for Hospitals (1984) requires each hospital to have procedures for:

> The emergency management of individuals who have actual or suspected exposure to radiation or who are radioactively contaminated. Such action may include radioactivity monitoring and measurement; designation and any required preparation of space for evaluation of the patient, including, as required, discontinuation of the air circulation system to prevent the spread of contamination; decontamination of the patient through an appropriate cleansing mechanism; and containment, labeling, and disposition of contaminated materials. The individual responsible for radiation safety should be notified.

Given the existing emergency room facilities of all the hospitals identified in the State plan and the radioisotope facilities in 37 of them, these facilities would be able to handle any conceivable patient load arising from an accident at the Perry facility. Because there are many hospitals available, and because the radiation health effects which might be observed are seldom if ever life threatening, the present plans and procedures are more than adequate to handle the medical consequences of an accident at the Perry plant.

13. In summary, the Applicant, the State and County plans have adequately addressed the hospital designations and the medical services to be provided by hospitals, including assistance to contaminated individuals, in the event of an accident at the Perry Nuclear Power Plant.

Roger E. Linnemann, M.D.

Subscribed and sworn before
me this 4th day of February, 1985.

Shelly K Koppler
Notary Public

My Commission Expires:

SHELLY KOFFLER
Notary Public, Phila., Phila Co.
My Commission Expires March 23, 1985

ROGER E. LINNEMANN, M.D.

EDUCATION

University of Minnesota, Minneapolis, MN; B.A. (Cum Laude) 1952

University of Minnesota, Minneapolis, MN; B.S., M.D. 1956

Walter Reed Army Hospital, Washington, D.C.; Internship 1956-57

Walter Reed Army Hospital, Washington, D.C.; Residency 1962-65

Certified by American Board of Radiology 1964

Certified by American Board of Nuclear Medicine 1972

Licensed to practice medicine in (1) Commonwealth of Pennsylvania, (2) Illinois; and (3) Minnesota

Sandia Base, New Mexico; Nuclear Weapons Orientation Course 1961

Walter Reed Army Institute of Research, Washington, D.C.; Medical Aspects of Nuclear Warfare 1962

PROFESSIONAL EXPERIENCE

1981-present	Vice Chairman and Chief Medical Officer, Radiation Management Corporation
1969-1981	President/Chief Executive Officer, Radiation Management Corporation
1974-present	Clinical Associate Professor of Radiology, University of Pennsylvania School of Medicine
1977-present	Visiting Associate Professor, Clinical Radiology, Northwestern University Medical School
1969-1974	Assistant Professor, Clinical Radiology, University of Pennsylvania School of Medicine
1968-1969	Nuclear Medical Consultant, Philadelphia Electric Company
January-August 1968	Assistant Professor, Radiology, University of Minnesota School of Medicine (investigated use of isotopes in kidney function evaluation)
1957-1968	Employed by United States Army:

1965-1968 Commanding Officer, Nuclear Medicine Research Detachment, Europe; Radiological Health Consultant, US Army-Europe. (responsible for plans, procedures and training of military hospitals and personnel in the evaluation, evacution and treatment of radiation casualties. In January 1966 sent to Palomaris, Spain for evaluation of medical and environmental aspects of the mid-air collision involving nuclear weapons)

1961-1962 Research Associate, Department of Radiobiology, Walter Reed Army Institute of Research, Washington, D.C. (investigated use of anti-radiation drugs in treatment of cancer)

1957-1961 General Medical Officer, Europe

PROFESSIONAL APPOINTMENTS

1982-present American Medical Association Counsel on Scientific Affairs Subcommittee on the Management of Radiation Accident Victims

1979-present Health Physics Society Standards Committee

1978-present General Dynamics Electric Boat Division Radiological Health Consultant

1973-present University of Pennsylvania Radiation Safety Committee

1970-present The American Nuclear Society Subcomm ttee for Writing Emergency Procedures Standards

1969 & 1975 Atomic Energy Commission ad hoc Committee on Medical Aspects of Radiation Accidents

1966-present American College of Radiology:

1969-present Commission on Radiologic Units, Standards of Protection
1969-present Committee on Radiation Exposure of Women
1969-present Committee on Radiological Aspects of Disaster Planning
1967-1978 International Affairs Committee

1965-1968 U.S. Delegate to NATO Radiation Protection Committee and Medical Aspects of Nuclear Warfare Committee

1971 present Department of Defense and Environmental Protection Agency Medical Liaison Officer's Network (MLON)-State of Pennsylvania Representative

PROFESSIONAL MEMBERSHIPS

American College of Radiology
American Public Health Association
American Medical Association
Society of Nuclear Medicine
Philadelphia Roentgen Ray Society
Pennsylvania Medical Society
College of Physicians of Philadelphia
Radiological Society of North America, Inc.
American Institute of Physicists/American Association of Physicists in Medicine
American College of Nuclear Physicians

AWARDS AND HONORS

1978 Association of Medicine & Security, Madrid, Spain (Honorary Member)

1968 University of Minnesota Radiological Research Scholar (National Research Council)

1968 United States Army Legion of Merit

PUBLICATIONS

Linnemann, Roger E. "The Acute Radiation Syndrome and its Impact on the Chain of Evacuation". Medical Bulletin, U.S. Army Europe:22, No. 12 December 1965)

Linnemann, Roger E. and Robert T. Wangemann. "Medical Support of Nuclear Weapons Accidents". Medical Bulletin, U.S. Army Europe (November 1967)

Linnemann, Roger E. and O. Messerschmidt. "Erholungsvorgaenge bei Grosstieren nach Ganzkoerperbestrahlung", :dem 6, Jahrbuch von der vereinigung Duetscher Strahlenschutzaerzte (1968)

Linnemann, Roger E. "Command Radiation Guidance" Military Medicine:33, pp. 771-716 (September 1968)

Loken, Merle K., Linnemann, Roger E. and George S. Kush. "Evaluation of Renal Function Using a Scintillation Camera and Computer" Radiology:93, No. 1, pp. 85-94 (July 1969)

Linnemann, Roger E., Loken, Merle K. and Colin Markland. "Computerized Compartmental Renograms to Study Kidney Function" Journal of Urology:103, pp. 533-537 (May 1970)

Linnemann, Roger E. and J.W. Thiessen. "Regional Approach to the Management of Radiation Accidents" Journal of the American Public Health Association:61 No. 6, pp. 1229-1235 (June 1971)

Linnemann, Roger E. and Robert H. Holmes. "Nuclear Accidents and Their Management" Emergency Medical Care, pp. 281-292, Spitzer, Stanley and Wilbur W. Oaks (eds.) New York: Brune and Stratton, Inc. (1971)

Linnemann, Roger E. "Medical Aspects of Power Generation" Impulse Massachusetts: Electrical Council of New England (June 1975)

Linnemann, Roger E. "Bugs in the Nuclear Fuel Cycle" Spectrum, p. 59, Gadi Kaplan (ed.) Piscataway, NJ: The Institute of Electrical and Electronic Engineers, Inc. (September 1975)

Linnemann, Roger E. and Fred A. Mettler, Jr. "Emergency Medical Assistance Programs for Nuclear Power Reactors" International Atomic Energy Agency Symposium on the Handling of Radiation Accidents, IAEA-SM-215/22, Vienna Austria (1977)

Linnemann, Roger E. "Why ALARA?" Transactions of 1979 American Nuclear Society Conference, Atlanta, GA (June 3-7, 1979), Vol. 32, TANS AO 32 1 83? ISSN 0003-018x (1979)

Linnemann, Roger E., Hackbarth, C.J. and Ray Crandall. "The Contaminated and Injured Patient" Proceedings of Twenty-Fourth Annual Meeting of the Health Physics Society, July 9-13, 1979 (Philadelphia, PA)

Linnemann, Roger E. "The Three Mile Island Incident in 1979: The Utility Resposne" The Medical Basis for Radiation Accident Preparedness, K.F. Hubne and S.A. Fry (eds), Elsvier/North-Holland, pp. 501-509 (1980)

Linnemann, Roger E. "Initial Management of Radiation Injuries" Journal of Radiation Protection, 5, No. 1, pp. 11-25 (December 1980)

Linnemann, Roger E. "Facilities for Handling the Contaminated Patient" Radiation Accident Preparedness: Medical and Managerial Aspects, Science-Thru-Media Company: New York (1980)

Linnemann, Roger E., Eugene Saenger, Gould A. Andrews and Niel Wald. "A Systems Approach to the Initial Management of Radiation Injuries" Systems Approach to Emergency Medical Care, Appleton-Century-Crofts: New York (1980)

Linnemann, Roger E., Stephen M. Kim and Frazier L. Bronson. "Three Mile Island: Medical and Public Health Aspects of a Radiation Accident" Journal of Radiation Protection, 6, No. 1, pp. 45-54 (October 1981)

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(Perry Nuclear Power Plant, Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicants' Motion For Summary Disposition of Contention P," "Applicants' Statement of Material Facts As To Which There Is No Genuine Issue To Be Heard on Contention P," and "Affidavit of Roger E. Linnemann on Contention P" were served this 5th day of February, 1985, by deposit in the U.S. mail, first class, postage prepaid, upon the parties listed on the attached Service List, except for those parties identified by asterisk who were served by hand delivery.

Jay E. Silberg

Jay E. Silberg

Dated: February 5, 1985

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