

UNITED STATES
NUCLEAR REGULATORY COMMISSION

'84 NOV -2 P12:34

Before the Atomic Safety and Licensing Board

In the Matter of)
)
Philadelphia Electric Company) Docket Nos. 50-352
) 50-353
(Limerick Generating Station,)
Units 1 and 2))

APPLICANT'S TESTIMONY RELATING TO LEA-24/FOE-1

Witness - Robert Klimm.

Introduction

1. The Pennsylvania Emergency Management Agency ("PEMA"), in consultation with the Pennsylvania Department of Transportation ("PennDOT"), developed evacuation time estimates for the plume exposure pathway emergency planning zone ("EPZ") for Limerick in 1983. The results of the PEMA analysis were documented in an "Evacuation Plan Map" for the Limerick Generating Station, dated June 1983. Applicant Philadelphia Electric Company ("Applicant") retained HMM Associates of Concord, Massachusetts in 1984 to prepare an updated evacuation time study pursuant to NUREG-0654, Rev. 1. In May 1984, HMM Associates completed a Final Draft evacuation time estimate report, entitled "Evacuation Time Estimates for the Limerick Generating Station Plume Exposure Emergency Planning Zone" (May 1984) ("ETE").

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LEA-24/FOE-1

(Lead Intervenor: LEA)

There is no assurance that plans for evacuation of the ten mile radius will not be impeded by traffic congestion in the vicinity of Marsh Creek State Park, Exton area (involving Route 100) and Valley Forge Park, King of Prussia area.

These areas should either be included in the Emergency Planning Zone or adequate plans for traffic control and direction should be made to avoid adverse effects on EPZ evacuation.

2. The impact of traffic congestion resulting from evacuation through the Marsh Creek State Park, the Route 100/Route 113 intersection, the Valley Forge Park, and the King of Prussia Area was taken into account in the Applicant's ETE. The manner in which these areas were treated in the ETE is outlined below. (R. Klimm)

Marsh Creek State Park

3. As indicated in the Applicant's ETE at pages 3-25, 3-26, A6-3, population and vehicle demand associated with the Marsh Creek State Park were included in the analysis for both winter and summer scenarios for evacuation of analysis areas 10 (0-10 mile south, 90°), 12 (Chester County) and 14 (entire EPZ). Discussions with the Director of the Chester County Department of Emergency Services indicated the desire to include an estimate of visitors to the park in the evacuation analysis, even though the park is located outside the EPZ. Due to the high number of park visitors, particularly during the summer months, and the fact that most

visitors would enter the park from Route 100, inclusion of this population category in the evacuation analysis was considered appropriate. The effect of traffic generated by the Marsh Creek State Park was therefore considered and analyzed in the ETE. (R. Klimm)

4. Applicant's FTE assumed on the basis of advice from Chester County officials that Marsh Creek Park visitors would be evacuated along Park Road to Route 100 and directed south. Accordingly, the ETE assumes, as indicated at page A6-3, that a peak traffic flow of 4,250 vehicles might be evacuated by this route along with other traffic directed south along Route 100. Nonetheless, an access control point has been established immediately beyond Marsh Creek Park at the intersection of Park Road and Moore Road to provide the capability to divert traffic from east on Park Road and direct it south on Moore Road. If this option were utilized, an additional traffic control point could be established at the intersection of Moore Road and Dorlan Road, directing traffic southwest on Dorlan Mills Road to Route 282, where another traffic control point could be established to divert traffic south. (R. Klimm)

5. The evacuation routes identified in the Applicant's ETE represent the primary routes to be used by evacuees. Use of other roadways would certainly be expected in the event of an emergency evacuation. It is expected that some of the vehicles evacuating south on Route 100 may utilize

I-76 west or Route 30 west, even though these are not identified as primary evacuation routes. (R. Klimm)

Route 100 and Route 113

6. The ETE did consider and analyze the intersection of Route 100 and Route 113. As indicated in the ETE at pages 4-7 and 4-8, evacuees from Spring City Borough, East Vincent Township, East Pikeland Township and West Pikeland Township would evacuate via local roads to Route 113 south, to Gordon Drive, to Route 100 south, to the Exton Mall. Traffic control points have been designated at the intersections of Gordon Drive and Route 113 (traffic control point No. 2903 on page 7-10 of ETE) and Gordon Drive at Route 100 (traffic control point No. 2902 on page 7-10 of ETE) to control and expedite the flow of evacuating vehicles along this corridor. Evacuees using this route will not be permitted to continue south on Route 113 past Gordon Drive. (R. Klimm)

7. As further indicated in the ETE, evacuees from the eastern portion of South Coventry Township, West Vincent Township, Upper Uwchlan Township, Uwchlan Township and the eastern portion of East Nantmeal Township would use local roads to Route 100 south, to Route 113 south, to the Downingtown High School. A traffic control point will be established at the intersection of Route 113 and Route 100 (traffic control point No. 2901 on page 7-10 of the ETE) to ensure that evacuees using this corridor would not merge with those evacuating from the previously identified townships. Those evacuees using this route, including those

evacuating the Marsh Creek State Park, would use Route 100 south and would be required to turn onto Route 113 south. Thus, these evacuees would not be permitted to continue on Route 100 south to the Exton Mall. The use of traffic control points to direct and divert traffic flows as indicated thereby precludes unanticipated traffic volume in the direction of Exton Mall. (R. Klimm)

Valley Forge/King of Prussia

8. Route 363 extends from the eastern portion of the EPZ as Trooper Road and runs south to an interchange with the Schuylkill Expressway extension and then south to an interchange with Route 23. Route 363 continues west on Route 23 and then runs south-southwest through the Valley Forge/King of Prussia area. North of the Route 23 interchange, Route 363 is a limited access, four-lane divided expressway. This expressway continues south and becomes the County Line Expressway at the Route 23 interchange. From there the Expressway continues south to Route 202. Therefore, the Route 363/County Line Expressway corridor is a limited access expressway from the interchange of the Schuylkill Expressway extension southward. (R. Klimm)

9. Vehicles evacuating from Upper Providence Township and Lower Providence Township would use local roads to Route 363 south, to County Line Expressway south, to Route 202 (DeKalb Pike) east, to I-76 north, to Route 276 east. The evacuation corridor comprised of Route 363 between the Schuylkill Expressway Extension and Route 23 - County Line

Expressway - Route 202 - I-76 - Route 276 is a limited access corridor. Access to and from this corridor is only available at Route 23 (Valley Forge Road), 1st Avenue, Route 202, Warner Road, and I-76. (R. Klimm)

10. For the ETE analysis, it was assumed on the basis of discussions with PEMA that traffic control would be required to restrict access to this corridor. Vehicles from the Valley Forge Park would be required to use Route 23 east (Valley Forge Road) and would not be allowed to enter Route 363/County Line Expressway. Likewise, vehicles from the King of Prussia area would not be allowed to enter Route 363/County Line Expressway north or south, but rather would use Route 363 easterly, which parallels the Route 363/County Line Expressway corridor. In short, control of the limited access Route 363 - County Line Expressway - Route 202 - I-76/Route 276 corridor would eliminate any possible conflict with other traffic in the Valley Forge Park/King of Prussia area. (R. Klimm)

PROFESSIONAL QUALIFICATIONS

ROBERT T. BRADSHAW

PROJECT MANAGER

'84 NOV -2 P12:34

ENERGY CONSULTANTS

EMERGENCY MANAGEMENT SERVICES DEPARTMENT

My name is Robert T. Bradshaw. My business address is 2101 North Front Street, Harrisburg, PA 17110. I am a Project Manager for the Emergency Management Services Department of Energy Consultants assigned to the Philadelphia Electric Company, Limerick Generating Station, Offsite Radiological Emergency Preparedness Project. As Limerick Project Manager, I supervise a staff of planners and trainers providing emergency preparedness assistance to the counties, municipalities, schools, and health care facilities in the vicinity of the Limerick Generating Station.

I attended Wilkes College from 1969 to 1974 and received a Bachelor of Science Degree in Environmental Science in 1974. I have also pursued graduate level study at Pennsylvania State University in urban and regional planning curriculum.

From 1975 to 1978, I worked as an environmental planner with the Luzerne County Planning Commission. From 1978 to 1981, I served as a planner with the Pennsylvania Department of Community Affairs, Bureau of Community Planning, Planning Services Division. From 1981 to 1983, I was a staff planner for the Pennsylvania Emergency Management Agency, Bureau of Plans and Preparedness. In that position, my primary responsibility was radiological emergency response planning for the five fixed nuclear facility sites in Pennsylvania. I served as PEMA's Project Officer for the Limerick Generating Station and Peach Bottom Atomic Power Station. During that period, I also served as a state controller for four offsite fixed nuclear facility exercises.

In January of 1983, I joined the staff of Energy Consultants as a planner and was assigned to the Offsite Emergency Preparedness Project for the Beaver Valley Power Station. In April of 1983, I was assigned as a planner to the Limerick Project, promoted to Project Coordinator in September 1983, and subsequently promoted to Project Manager in January 1984.

In February of 1982, I attended and successfully completed a two week Radiological Emergency Response Training Course sponsored by the Federal Emergency Management Agency at the Nevada Nuclear Test Grounds in Mercury, Nevada.

PROFESSIONAL QUALIFICATIONS

MORTON I. GOLDMAN
Senior Vice President - Technical Director
NUS Corporation

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My name is Morton I. Goldman. I am Senior Vice President and Technical Director of NUS Corporation, 910 Clopper Road, Gaithersburg, Maryland, 20878. I have served in this capacity since January 1982. Prior to this assignment, I had been Senior Vice President, Environmental Systems Group in which I was responsible for all site evaluations, safety analyses, waste management system evaluations, health effects analyses, and environmental programs conducted by this group. This included the evaluation of site and environmental safety factors for about 50 nuclear and fossil-fueled plants in this country and abroad.

I graduated from New York University in 1948 with the degree of Bachelor of Science in Civil Engineering. In 1950, I received a Master of Science degree in Sanitary Engineering; in 1958, a Master of Science degree in Nuclear Engineering; and in 1960, a Doctor of Science degree, all from the Massachusetts Institute of Technology.

From 1948 to 1949, I was a Research and Teaching Assistant at the Sanitary Engineering Research Laboratory, New York University, conducting research on water coagulation and assisting in teaching sanitary chemistry and sanitary biology laboratory courses.

From 1949 to 1950, I was a Research Assistant at the Radioactivity Research Laboratory, Sanitary Engineering Department, Massachusetts Institute

of Technology, conducting original research on removal of radionuclides from water by standard water treatment techniques.

From 1950 to 1956, I was on loan to the Oak Ridge National Laboratory as Chief of Soils and Engineering Section, Waste Disposal Research Activities. In this position I conducted and supervised research on disposal of radioactive wastes at Oak Ridge National Laboratory.

From 1956 to 1959, I was assigned to Massachusetts Institute of Technology as Project Leader for the Radioactive Waste Disposal Project of the Sanitary Engineering Department, and in training in the Nuclear Engineering Department. In the former capacity, I initiated and supervised research on novel methods of disposal of high activity fission product waste materials. I also served as secretary to the MIT Reactor Safeguards Committee.

From 1959 to 1961, I was designated as Nuclear Installation Consultant with the Division of Radiological Health in Washington, D.C. In this capacity I provided technical consultation and assistance to state and federal agencies on health and safety problems associated with nuclear installations. As part of my responsibility, I served on a working group responsible for the Radioactivity Section of the USPHS Drinking Water Standards (1960).

Since 1961, I have been with NUS corporation and active in the environmental and safety activities described earlier. I was elected Vice President and General Manager, Environmental Safeguards Division in January 1966, and Senior Vice President, Environmental Systems Group in February 1973.

In 1968, I served as U.S. representative to and chairman of an IAEA expert panel on Radioactive Waste Management at Nuclear Power Plants, resulting in IAEA Safety Series No. 28 of that title. From 1972 to 1975, I served as consultant to and witness for the Consolidated Utility Group in the AEC/NRC rulemaking hearing on "as low as practicable" radioactive waste discharge standards. From 1977 to 1982, I served as consultant to and witness for the Utility Group participants in the GESMC rulemaking hearing, and from 1978 to 1981 was consultant and witness in the NRC's Consolidated radon hearing originating in the Perkins proceeding.

I am the author and coauthor of a number of papers on radiation and public health, nuclear safety and siting, and radioactive waste management.

I am a member of the American Society of Civil Engineers, and the American Nuclear Society. I am a licensed Professional Engineer in the states of New York, Maryland, California, South Carolina, Arizona, and the District of Columbia; and a Diplomat of the American Academy of Environmental Engineers in radiation hygiene and hazard control. I am a member and former chairman of the ASCE Technical Committee on Nuclear Effects, and a member of the Nuclear Energy Committee, ASCE. Other activities include Chairman, Atomic Industrial Forum Ad Hoc Committee on De Minimis Concept in Radiation Protection, and Radiological Aspects of the Clean Air Act. I am also a member of Steering Group, AIF Committee on Environment; member, Committee on Nuclear Standards, ASCE; member, Standards Committee ANS-2 on Site Evaluation.

PROFESSIONAL QUALIFICATIONS

GEOFFREY D. KAISER
Manager, Consequence Assessment Department
NUS Corporation

My name is Geoffrey D. Kaiser. My business address is 910 Clopper Road, Gaithersburg, Maryland 20878. I am manager of the Consequence Assessment Department. In that position, I am responsible for managing projects relating to the consequences of accidental releases of radioactive, toxic, and flammable chemicals.

I received a Bachelor of Arts degree in Physics from Cambridge University (UK) in 1964; a Master of Arts degree in Physics from Cambridge in 1967; and a Doctor of Philosophy in Elementary Particle Physics, also from Cambridge University in 1968. Subsequently, I had postdoctoral research fellowships in theoretical particle physics at the Cavendish Laboratory at Cambridge and the University of Miami. I held a temporary lectureship in applied mathematics at the University of Durham (UK) during the academic year 1970/71 and served as a Senior Research Associate in theoretical particle physics at the Daresbury Nuclear Physics Laboratory, Warrington, UK, from 1971 to 1974.

From 1974 to 1980 I worked at the United Kingdom Atomic Energy Authority's Safety and Reliability Directorate (SRD) in the Environmental and Fission Product Group. In 1976, I was appointed Head of Physics and led a group which grew to include 10 people involved in the development of methods with which to predict the consequences of the accidental release of radiotoxic, chemically toxic, and flammable materials to the environment. During my time at SRD, I developed the nuclear consequence modeling code TIRION, which was widely used

in the United Kingdom and abroad in applications to reactors, reprocessing plant, nuclear shipping, and the transport of plutonium by road, rail, and sea. The most important application of TIRION was at the Windscale Inquiry into the building of a reprocessing plant for oxide fuel. I also participated in and/or managed multidisciplinary projects relevant to the safety and environmental impact of advanced technologies, including participation in the well-known Canvey Island Study.

I was a frequent speaker at seminars and international conferences, and participated as a lecturer at courses arranged by the United Kingdom Atomic Energy Authority. I chaired several international working groups on consequence analysis.

In 1981, I joined NUS Corporation and in 1982, became Manager of the Consequence Assessment Department. Since that time I have been involved in many significant projects. I provided overall technical management for the phenomenological and consequence analysis portions of the Susquehanna Probabilistic Risk Assessment, and for the consequence analysis and transportation accident analysis for Limerick. I have recently been managing the Phase 2 probabilistic safety study for the Swedish State Power Board's Ringhals 2 plant, the purpose of which is to develop source terms for severe accidents. I am also responsible for the consequence analysis for the Industry Degraded Core Rulemaking Program. I have managed "mini-PRAs" for the Palo Verde and Hope Creek Nuclear Generating Stations and have written Chapter 7 of the environmental reports for Hope Creek and Limerick. I was a founder member, and also an author and co-editor, of the committee on the Safety of Nuclear Installations International Benchmark Comparison of Consequence Modeling Codes.

PROFESSIONAL QUALIFICATIONS

E. ROBERT SCHMIDT
Director, Systems Analysis
NUS Corporation

My name is E. Robert Schmidt. My business address is 910 Clopper Road, Gaithersburg, Maryland 20878. I am Director of the Systems Analysis Group of the Consulting Division and as such am responsible for directing all systems analysis consulting services associated with nuclear and nonnuclear technology, including radiological and nonradiological accident analysis, thermal-hydraulic and heat transfer analysis, and risk assessment and probabilistic safety analysis.

I received a Bachelor of Science degree in Mechanical Engineering from the University of Missouri in 1958 and a Master of Science degree in Nuclear Engineering from the same institution in 1959. After graduation I worked for General Electric for one year. I then worked for Internuclear Company from 1960 to 1963. During that time I developed design criteria and analyzed in-pile loops of the experimental gas-cooled reactor at Oak Ridge National Laboratory and participated in the design of several small reactors.

I have been with NUS Coporation since 1963 and during that the time I have been involved in all facets of the design, operation, and analysis of nuclear power plants. I was onsite startup consultant to the Government of India, the Japan Atomic Power Company, and the Toyko Electric Power Company for the startup of four BWR units.

I have directed a vast amount of licensing and safety analysis work and have participated in many special nuclear technologies studies. Some of the most significant include a study of steam cycle conditions for a prototype large breeder reactor, safety analysis report review for foreign licensing authorities and domestic utilities, industrial and aircraft impact hazards analysis, containment and subcompartment temperature and pressure analyses, and the design and safety analysis of several spent fuel shipping casks.

Prior to my current position, I was Manager of the Reliability and Risk Assessment Department. I performed and directed risk assessments, degraded core accident evaluations, safety goal analyses, and detailed assessments of the probabilities and consequences of accidents involving hazardous material transport near a nuclear power station. I was also involved in a study of aircraft impact probabilities which included providing hearing board testimony.

Most recently I have been responsible for directing the Kuosheng, Susquehanna, and Ringhals 2 risk assessments. I also directed the Limerick external event risk assessment, and with Mr. Saul Levine, provided the technical monitoring of the Limerick inplant failure risk study. I also managed limited scope, mini-PRAs for six nuclear power plants.

I am a Registered Professional Engineer in the District of Columbia. I am a member of the American Nuclear Society, the American Society of Mechanical Engineers, and the Society for Risk Analysis.

PROFESSIONAL QUALIFICATIONS

ROBERT WALLER
Director, Gaithersburg Office, PEC Division
NUS Corporation

My name is Robert Waller. My business address is 910 Clopper Road, Gaithersburg, Maryland 20878. I am Director of the Gaithersburg Regional Office of the PEC Division of NUS.

I received a Bachelor of Science degree in Chemical Engineering from Rensselaer Polytechnic Institute in 1958, a Master of Science degree in Environmental Engineering from Rensselaer in 1961, and a Doctor of Philosophy in Environmental Engineering Science from the Johns Hopkins University in 1966.

After receiving my Bachelor's degree, I worked for the New York State Department of Health in the Water Supply Section from 1958 to 1962. My primary responsibilities included the review and evaluation of the design and operation of new and existing water supply treatment plants throughout the New York State. Other areas of activity included the collection of data, evaluation of new water treatment techniques, establishment of emergency water supplies, and presentation of training courses.

From 1966 to 1969, I worked for E. I. du Pont de Nemours Company, Inc. I was responsible for technical assistance on more than 60 different problems involving over 30 different plants that manufactured a wide variety of organic and inorganic chemicals, as well as explosives, plastics, ammunition, paints, and pesticides. I developed waste treatment facility designs,

planned and directed waste characterization and pollution abatement programs for individual plants, provided assistance for resolution of treatment plant operational problems, and provided liaison with regulatory agencies.

Working for Hittman Associates, Inc., from 1969 to 1972, I was responsible for all technical activities relating to water pollution control. These included industrial waste treatment consulting and process development, advanced waste treatment system development, planning and direction of governmental and industrial research and demonstration projects, and corporate research programs. I made technical contributions to the following projects: (1) environmental aspects of alternatives to the internal combustion engine, (2) alternative approaches to storm water management and erosion control, and (3) evaluation of the potential of desalting technology for meeting water resource needs.

From 1972 to 1980, I had overall corporate responsibility for program management, operations, and production for Environmental Quality Systems, Inc. I was project manager for more than 25 different projects and made significant technical and policy contributions to more than 20 other projects. Special areas of expertise included waste treatment process development and design, management of toxic and hazardous materials, process residue treatment and disposal, industrial waste treatment, emergency water and waste systems, areawide water quality planning, evaluation of emerging technology, control of non-point-source pollutants, and environmental impact analysis. In addition, I was a special UNESCO Consultant to the Kingdom of

Morocco and a member of a National Science Foundation Inspection Team evaluating damages to the water and sewage systems of Sendai, Japan after a major earthquake.

Since joining NUS Corporation in 1980, I have been responsible for the management and technical direction of projects involving hazardous, industrial, and municipal wastes. I act as principal-in-charge (PIC) on projects performed in the PEC Gaithersburg office as well as project manager on larger projects. Areas of responsibility include impact evaluation, problem definition, technology assessment, planning, evaluation and design of remedial action alternatives, and program planning. I managed a multidisciplined Public Works Group that completed over 40 facility planning and design assignments for government clients.