

RELATED CORRESPONDENCE

August 31, 1984

DOCKETED  
USNRC

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

'84 SEP -4 A11:15

Before the Atomic Safety and Licensing Board

In the Matter of

CAROLINA POWER & LIGHT COMPANY  
and NORTH CAROLINA EASTERN  
MUNICIPAL POWER AGENCY

(Shearon Harris Nuclear Power  
Plant)

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Docket No. 50-400 OL

APPLICANTS' TESTIMONY OF ROBERT W. PRUNTY AND  
PETER M. YANDOW IN RESPONSE TO EDDLEMAN  
CONTENTION 9 (ENVIRONMENTAL QUALIFICATION  
OF ELECTRICAL EQUIPMENT)

Q.1 Please state your names.

A.1 Robert W. Prunty and Peter M. Yandow.

Q.2 Mr. Prunty, please state your address, present occupation and employer.

A.2 (RWP) I am employed by Carolina Power & Light Company ("CP&L") as a Principal Engineer in the Electrical and Instrumentation and Control ("I&C") areas. My business address is the Shearon Harris Nuclear Power Plant ("SHNPP"), P.O. Box 101, New Hill, North Carolina 27562.

Q.3 State your educational background and professional work experience.

A.3 (RWP) I graduated from the University of South Carolina in 1971 with a Bachelor of Science degree in Electrical Engineering. I have worked in the nuclear field for 13 years.

Upon graduation, I entered the U.S. Navy as a commissioned officer through the Naval ROTC program. I attended the Naval Nuclear Power School at Bainbridge, Maryland, and qualified as Engineering Officer of the Watch ("EOOW") at the operational Nuclear Power Training Unit reactor in Windsor, Connecticut. Upon completion of this one-year training program, I attended the Navy's basic submarine school and was assigned to the USS Flasher, an attack submarine in Pearl Harbor, Hawaii. In 22 months on board I qualified as EOOW and Officer of the Deck ("OOD"), earning my submarine "Dolphins".

I then attended the advanced submarine school for six months and was assigned to the U.S.S. Daniel Boone, a ballistic missile nuclear submarine, spending 16 months of my two-year tour in the Portsmouth, New Hampshire, Naval Shipyard during a major overhaul. While on the U.S.S. Daniel Boone, I requalified as EOOW and OOD, and also successfully completed a comprehensive oral and written examination administered by Naval Reactors in Washington, D.C. to become certified as Chief Engineer of a nuclear vessel. My work and watchstanding experience on both ships covered the entire array of electrical, I&C, and mechanical systems operation and interaction.

For the next two years I was assigned as an officer instructor at the Naval Nuclear Power School, now located in Orlando, Florida, teaching integrated plant operations, tying together the theoretical knowledge of reactor physics, accident analysis, and classical engineering with the overall operation of a nuclear power plant. I became division director during the second half of my tour.

In mid-1979 I came to work for CP&L as a Senior Engineer in the electrical discipline at the corporate offices in Raleigh, North Carolina. In late 1979 I was made lead electrical engineer of the newly formed Harris Plant Engineering Section ("HPES") which was established at the SHNPP site. I have subsequently been promoted to Project Engineer and Principal Engineer. I am responsible for technical interface with Ebasco in the areas of design and design change control; for field

interface in the area of design problem and constructability resolution; for commercial interface with Ebasco, Westinghouse, and numerous SHNPP equipment vendors; for operational interface and operability problem resolution with plant start-up and operations personnel; for quality assurance and regulatory interface with both internal and external groups interacting with CP&L; and for the Environmental Qualification Program at the SHNPP.

I am a registered professional engineer in the State of Florida and am a member of the Institute of Electrical and Electronics Engineers ("IEEE") and Tau Beta Pi professional engineering society.

Q.4 Please elaborate on your professional experience that is directly relevant to the testimony which you are presenting regarding environmental qualification of electrical equipment at the SHNPP.

A.4 (RWP) I have been directly involved in environmental qualification since my assignment as lead electrical engineer of the newly formed HPES in December 1979. I was responsible for the establishment of the SHNPP Environmental Qualification Program and am integrally involved with formulating the SHNPP compliance with 10 C.F.R. § 50.49, NUREG-0588, and other NRC regulatory directives. Additionally, I am the technical supervisor of the Instrumentation and Control Group and until recently was also technical supervisor of the Electrical Group. These two groups specify and procure a majority of the

equipment covered by the Environmental Qualification regulations.

Q.5 Mr. Yadow, please state your address, present occupation and employer.

A.5 (PMY) I am employed by Carolina Power & Light Company as an Electrical Engineer. My business address is Shearon Harris Nuclear Power Plant, P.O. Box 101, New Hill, North Carolina 27562.

Q.6 State your educational background and professional work experience.

A.6 (PMY) I have a Bachelor of Science in Electrical Engineering from Northeastern University in Boston, Massachusetts.

I have worked in the nuclear power field for 10 years. This does not include co-operative engineering work during my years as a student. After graduation from Northeastern in 1974, I worked for Stone & Webster Engineering Corporation in Boston, Massachusetts in the Controls Group. I was a trainee in their career development program which included three-month assignments in various parts of the company on various projects. After Stone & Webster engineering, I worked for Combustion Engineering in the Instrument and Controls Design Group. Combustion Engineering is a nuclear steam supply system manufacturer located in Windsor, Connecticut. During this time I was responsible for backfits on five operating nuclear unit reactor protection systems. This included setpoint calculations of instrument loops.



In 1978 I was employed by the Yankee Atomic Electric Company in Framingham, Massachusetts. Yankee Atomic Electric Company is a design engineering consultant for a group of northeastern utilities. In this assignment I worked in the Instrument and Control Engineering Group as an engineer. In 1979, I was involved in the first backfits following the issuance of NRC Bulletins 79-01, 79-01A, 79-01B (on environmental qualification concerns) and NUREG-0737 (TMI Action Plan). Before leaving I was Senior Engineer in charge of Instrument and Control Design at Yankee for the Maine Yankee Atomic Power Plant in Wiscasset, Maine. This included on-site work during two refuelings and support for several others.

In 1983, I joined CP&L as a Senior Engineer in the Instrument & Control Engineering Group at SHNPP. I am currently responsible for the Environmental Qualification Program at the SHNPP.

Q.7 Please elaborate on your professional experience that is directly relevant to the testimony which you are presenting regarding environmental qualification of electrical equipment at the SHNPP.

A.7 (PMY) During my ten years of work experience I have worked in the Instrument and Control Area as an electrical engineer. Because the first items of concern in the Equipment Qualification Area were on electrical equipment, I was assigned responsibility to address these concerns. This included training on equipment qualification terminology and techniques

in the equipment qualification field. I have contributed to utility responses to NRC environmental qualification concerns (Bulletins 79-01, 79-01A, 79-01B, and NUREG-0588). This includes equipment selection, specification writing, purchasing and installation in operating plants. During the last year I have been assigned to coordinate the environmental qualification effort at the SHNPP. This involves coordination of the efforts of our architect engineer, Ebasco, and NSSS supplier, Westinghouse Electric Corporation, with respect to the CP&L program at the SHNPP. I also coordinate and work on NRC Information Notices and Bulletin Responses for the Instrument and Control Group of the Harris Plant Engineering Section.

Q.8 What is the purpose of this testimony?

A.8 (RWP, PMY) The purpose of this testimony is to describe briefly the program for environmental qualification of electrical equipment at the SHNPP, so that we may place in context our testimony and the testimony of Applicants' other witnesses which will address specific allegations found in Eddleman Contention 9. Contention 9 states, in its entirety:

The program for environmental qualification of electrical equipment at Shearon Harris is inadequate for the following reasons:

- A. The proposed resolution and vendor's modification for ITT-Barton transmitters has not been shown to be adequate. (Ref. IE Information Notices 81-29, 82-52 and 83-72).
- B. There is not sufficient assurance that the concerns with Limitorque valve operators identified in IE Information Notice 83-72 (except for Items C2, C5 and C7) have been adequately resolved.

- C. It has not been demonstrated that the RTDs have been qualified in that the Arrhenius thermal aging methodology employed is not adequate to reflect the actual effects of exposures to temperatures of normal operation and accidents over the times the RTDs could be exposed to those temperatures. (Ref. NUREG/CR-1466, SAND-79-1561, Predicting Life Expectancy of Complex Equipment Using Accelerated Aging Techniques.)
- D. The qualification of instrument cables did not include adequate consideration and analysis of leakage currents resulting from the radiation environment. These leakage currents could cause degradation of signal quality and/or spurious signals in Harris instrument cables.
- E. There is not sufficient assurance that the physical orientation of equipment in testing is the same as the physical orientation of equipment installed.
- F. The effects of radiation on lubricants and seals have not been adequately addressed in the environmental qualification program.
- G. There is inadequate assurance that failure to report all results of environmental qualification tests, including failures, has been brought to light in connection with electrical equipment installed in Harris. This includes past test failures of equipment which subsequently passes an EQ test and test failures of equipment which is said to be qualified by similarity. (Ref. Item 2, Page 5, L. D. Bustard et al., Annual Report: Equipment Qualification Inspection Program, Sandia National Laboratories, FY83).

Q.9 What is the purpose of the program for environmental qualification of electrical equipment at the SHNPP?



A.9 (RWP, PMY) Equipment that is relied on to perform a necessary safety function must be demonstrated to be capable of maintaining functional operability under all service conditions postulated to occur during its installed life for the time it is required to operate. The purpose of the environmental qualification program for electrical equipment at the SHNPP is to ensure all safety-related electrical equipment and other electrical equipment important to safety is qualified to be capable of performing its safety functions in the environment postulated for design basis events. Environmental conditions include temperature, pressure, humidity, radiation, chemicals, and submergence.

Q.10 What regulatory requirements apply to Applicants' environmental qualification program?

A.10 (RWP, PMY) The Commission's regulations at 10 C.F.R. § 50.49 establish requirements for environmental qualification of electrical equipment important to safety. Equipment "important to safety" includes safety-related electrical equipment and nonsafety-related electrical equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions by safety-related equipment. At the SHNPP, all equipment "important to safety" is safety-related. In general, environmental qualification is required to meet General Design Criteria 1, 2, 4 and 23 of Appendix A, and Sections III and XI of Appendix B, to 10 C.F.R. Part 50. Staff guidance for meeting the regulatory requirements in 10

C.F.R. § 50.49 is provided in NUREG-0588 (Revision 1), "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment."

Q.11 Where is Applicants' environmental qualification program described?

A.11 (RWP, PMY) Applicants' environmental qualification program is described in some detail in the Shearon Harris Nuclear Power Plant Final Safety Analysis Report ("FSAR") at Section 3.11. FSAR Appendix 3.11A compares Applicants' procedures for environmental qualification of electrical equipment with NUREG-0588. FSAR Section 3.11 and Appendix 3.11A are Applicants' Exhibit \_\_\_\_\_.

Q.12 In general, how do Applicants ensure electrical equipment is qualified to withstand postulated harsh environments?

A.12 (RWP, PMY) Applicants' program for environmental qualification of electrical equipment is designed in accordance with 10 C.F.R. § 50.49 and NUREG-0588 (which is endorsed by 10 C.F.R. § 50.49(k)). The principal elements of Applicants' program to meet Section 50.49 include:

- (1) Identify on the Master List all electrical equipment required to be environmentally qualified.

- (2) Identify environmental parameters at equipment locations, e.g., radiation, temperature, humidity.

- (3) Specify equipment for the appropriate environmental parameters in accordance with applicable NRC regulations and guidance and industry standards.

(4) Evaluate vendor proposals for meeting the specifications and evaluate vendor test plans prior to testing.

(5) Review vendor environmental qualification reports.

(6) Assemble Environmental Qualification Packages containing all required documentation.

(7) Prepare documentation for NRC Staff audit, including:

(a) Environmental Qualification Program Report;

(b) Master List;

(c) Component Evaluation Sheets;

(d) Environmental Qualification Packages.

(8) Respond to any Staff audit findings and requests for additional information.

(9) Qualify all equipment prior to fuel load.

(10) Monitor NRC and other studies, reports and Information Notices, IE Bulletins, vendor information and other industry experience for applicability to the SHNPP.

Q.13 How have Applicants organized their direct case in response to Eddleman Contention 9?

A.13 (RWP, PMY) Applicants are presenting a separate piece of testimony on each of the seven specific allegations in Eddleman Contention 9, as follows:

1. "Applicants' Testimony of Robert W. Prunty, Peter M. Yandow and Richard B. Miller in response to Eddleman Contention 9A (ITT-Barton Transmitters)."

2. "Applicants' Testimony of Robert W. Prunty and Peter M. Yandow in Response to Eddleman Contention 9B (Limitorque Valve Operators)."
3. "Applicants' Testimony of Richard B. Miller and Thomas W. Dakin in Response to Eddleman Contention 9C (Thermal Aging of RTDs)."
4. "Applicants' Testimony of Richard M. Bucci and Edwin J. Pagan in Response to Eddleman Contention 9D (Instrument Cables)."
5. "Applicants' Testimony of Richard M. Bucci, Edwin J. Pagan and Edward M. McLean in Response to Eddleman Contention 9E (Physical Orientation of Equipment)."
6. "Applicants' Testimony of Richard M. Bucci, Edwin J. Pagan and Peter M. Yandow in Response to Eddleman Contention 9F (Lubricants and Seals)."
7. "Applicants' Testimony of Robert W. Prunty, Richard M. Bucci, Edwin J. Pagan and Kumar V. Hate in Response to Eddleman Contention 9G (Type Test Reporting)."