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)	)	

AFFIDAVIT OF DAVID R. GREEN IN
RESPONSE TO LICENSING BOARD'S MAY 9, 1983
ORDER CONCERNING ISSUE NO. 9

County of Lake)
: ss:
State of Ohio)

David R. Green, being duly sworn, deposes and says as follows:

1. I, David R. Green, am Senior Project Engineer, Nuclear Engineering Department, The Cleveland Electric Illuminating Company ("CEI"). My business address is 10 Center Road, Perry, Ohio 44081. A summary of my professional qualifications and experience is attached hereto as Exhibit A. I have personal knowledge of the matters set forth herein and believe them to be true and correct.

2. As part of the overall surveillance and maintenance program for Perry Nuclear Power Plant ("PNPP"), CEI plans to implement a program to test for polymer degradation in electrical cable insulation as a function of gamma radiation dose rate and temperature. Cable samples of various physical construction and

polymeric composition will be subjected to various radiation dose rates and temperatures during normal operation of PNPP Unit 1. The effects of these different conditions on the cable insulation will be measured at specific intervals. Detailed procedures, instructions and guidelines for the program are being developed.

3. The program will test six different types of safety-related (Class 1E) electrical cables used at PNPP. See Attachment A. These cables are representative of the polymers used in safety-related cable insulation at PNPP. In addition, the selection of types of cable for testing was made using as guidance Table 1 of IEEE 383-1974, "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations."

4. The electrical cable samples to be tested will be placed in the following environmental zones:

(a) Zone DW-2 (160 rads/hr., 134°F). Zone DW-2 will have the highest gamma radiation dose rate during normal full power operation.[1/] The temperature in Zone DW-2 will be equal to the highest average temperature in any zone during normal full power operation.

1/ In the Affidavit of Srinivasan Kasturi in Support of NRC Staff Motion for Summary Disposition of Issue No. 9, dated February 4, 1983 ("Kasturi Affidavit"), Table 3, Zone CT-5 was shown to have the highest normal full power dose rate with a rate of 357 rads/hr. However, it was later discovered that no polymers in Zone CT-5 will be exposed to that dose rate. The normal full power dose rate for polymers in Zone CT-5 will in fact be 100 rads/hr.

(b) Zone FB-6 (27 rads/hr., 119°F). Zone FB-6 will have an intermediate gamma radiation dose rate and average temperature during normal full power operation.

(c) Zone CT-6 (10.7 rads/hr., 130°F). Zone CT-6 will have the lowest gamma radiation dose rate greater than 10 rads/hr.[2/] during normal full power operation.

(d) Zone TB-1 (10.7 rads/hr., 98°F). Zone TB-1 will have the same dose rate as Zone CT-6, but will have a significantly lower average temperature.

(e) Zone ESW (5 X 10E-4 rads/hr., 81°F). Zone ESW will have the lowest gamma radiation dose rate during normal full power operation.

5. Eighty feet of each type of cable to be tested, plus 10 additional feet of each type for baseline testing, will be obtained from cable storage for each of the five zones. The cables will be sealed on both ends by use of a shrink cap in order to keep out moisture. The cables will then be installed in open cable trays in the selected environmental zones.

6. The sample cables will not be energized as part of their conditioning. This is representative of the fact that all the safety-related cables in environmental zones with a normal radiation dose

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2/ See Kasturi Affidavit at ¶37.

rate of 10 rads/hr. or greater either will be normally de-energized or will be energized at levels too low to generate significant internal heating.

7. Temperature and gamma radiation dose rate for each environmental zone will be measured at regular intervals under normal full power operation. In addition, records will be maintained of plant operations that affect these environmental zones.

8. Baseline testing of electrical cable samples will be conducted prior to fuel loading of Unit 1. Samples will be obtained from each zone and testing conducted every third refueling outage.

9. Testing of the electrical cable samples will consist of the following. First, the cable will be visually inspected for any embrittlement or other degradation. Second, mechanical properties of elongation and tensile strength will be tested according to Insulated Cable Engineers Association ("ICEA") Standards.[3/] Third, a dielectric strength test will be conducted according to IEEE 383-1974, ¶ 2.3.3.4.

10. All testing will be conducted at a laboratory with an approved quality assurance program. The test results will be evaluated by CEI's Nuclear Engineering Department. Acceptance criteria will be established prior to testing.

3/ ICEA Standard S-68-516 §§ 6.6 and 6.8, will be used for ethylene-propylene rubber. ICEA Standard S-66-524, §§ 6.4.11.3 and 6.4.11.5, will be used for cross-linked polyethylene and cross-linked polyolefin.

11. In addition to the program for testing of electrical cable samples described above, maintenance personnel will be instructed as part of their training to report degradation in permanent plant cables. Testing of the electrical or mechanical properties of permanent plant cables will be conducted as necessary in response to particular maintenance problems should they occur.

12. CEI's program for testing of sample electrical cables will adequately represent the types of safety-related cable at PNPP and will envelope the range of dose rates and temperatures to which permanent plant cables will normally be exposed. Therefore, access to all key locations where polymer degradation in electrical cable insulation might occur is not necessary. If the testing program or a maintenance problem with permanent plant cable reveals that polymer degradation in electrical cable insulation may pose a threat to the public health or safety, appropriate preventive or corrective actions will be taken.

David R. Green

David R. Green

Submitted and sworn to before me
this 3rd day of August 1983

Deborah L. Wheeler

Notary Public

My Commission expires:

October 8, 1986

DEBORAH L. WHEELER
Notary Public, State of Ohio
My Commission Expires October 8, 1986
(Recorded in Lake County)

ATTACHMENT A

MANUFACTURER	SPEC. NUMBER	BILL OF MATERIAL NUMBERS (NOTE 1)	INSULATION MATERIAL	USE CATEGORY	CONDUCTOR CONFIGURATION (NOTE 3)
Anaconda	SP-559	EKA-114,124,134 & 154	Ethylene-Propylene Rubber	Medium Voltage Power	3/C #4/0
Brand Rex	SP-561	EKC-9, 19 & 20	Cross-Linked Polyethylene	Instrumentation	4 - STQ #20
Rockbestos	SP-560	EKB-5, 15, 25 or 45	Cross-Linked Polyolefin	Small Power and Control	7/C #14
Rockbestos	SP-793-01	EKC-74, 84, 94 & 104	Rockbestos Polymer LD Cross-Linked, Modified Polyolefin (Note 2)	Instrumentation	Coax
Rockbestos	SP-793-01	EKC-78, EKC-89	Cross-Linked Polyolefin	Instrumentation & Thermocouple	1 - STP #20 & 11/C #20
Samuel-Moore	SP-567	EKF-2, 6, 10 & 14	Cross-Linked Polyolefin	Thermocouple	4 - STP #20

NOTES:

1) Multiple Cable Numbers for the same item are identical cables with different jacket colors.

2) Coaxial cables are qualified as a system. This consists of conductor, 1st Insulation (Rockbestos Polymer LD), 2nd Insulation (Cross-Linked, Modified Polyolefin), Shield and Jacket (Cross-Linked Modified Polyolefin).

3) STP - Shielded Twisted Pair
STQ - Shielded Twisted Quad

EXHIBIT A

DAVID R. GREEN

PROFESSIONAL QUALIFICATIONS

My name is David R. Green. I am employed as a Senior Project Engineer in the Nuclear Engineering Department of the Cleveland Electric Illuminating Company. I have extensive and intensive experience in design, construction, startup, operations, maintenance, and electrical equipment failure diagnosis and repair engineering for both nuclear and fossil-fueled power plants. I also act as CEI's Rotating Electrical Machinery Specialist.

EXPERIENCE	THE CLEVELAND ELECTRIC ILLUMINATING COMPANY since 1955.
1981 to present	Senior Project Engineer, Engineering Unit, Nuclear Design Section of Nuclear Engineering Department - responsible for construction and startup support engineering (electrical and mechanical) for Perry Nuclear Power Plant. Also responsible to serve as CEI's Rotating Electrical Machinery Specialist.
1979-81	Senior Project Engineer, Electrical and Instrumentation and Control - responsible for electrical, instrumentation and control design for Perry Nuclear Power Plant.
1975-79	Senior Electrical Engineer - responsible for all electrical design for Perry Nuclear Power Plant.
1973-75	Project Electrical Engineer - responsible for electrical design construction and startup for Avon 10 and Eastlake 6 plants, both 35-MW gas turbine projects.
1968-72	Project Electrical Engineer - responsible for electrical engineering on all phases of Eastlake Plant, a 650-MW coal-fueled unit, including the direction of the electrical check, test, and startup.
1969-71	Project Engineer - responsible for design, construction, startup on the world's first 345 KV SF6 Gas-Insulated Bus, installed at the Eastlake Plant.

1955-68	Project Electrical Engineer - participated in various engineering positions on the following projects: Avon 9 (a 650-MW fossil plant), Lakeshore 18, Avon 8, Ashtabula 5, and Eastlake 4 (all 250-MW coal-fueled plants). Served as Plant Electrical Operator during two company strikes for periods totaling 6 months (1968 and 1973).

EDUCATION:

B.S. Electrical Engineering, Case Institute of Technology, 1955.
Power Systems Engineering Course (9 months), General Electric, 1966-67.
Numerous seminars and short courses including General Electric BWR training.

REGISTRATION:

Professional Engineer, Ohio, 1958.

SOCIETIES:

IEEE Memberships include:
- Rotating Machinery Committee, 1967-present.
- Synchronous Machinery Subcommittee, 1967-present.
- Working Group Chairman - Turbine Generator Shaft Stress, 1972-present.
- Excitation Systems and Equipment, 1967-present.
- Nuclear Power Engineering - Qualification Subcommittee, 1975-present.
- Working Group Member, IEEE 649 Qualification of Motor Control Centers for Nuclear Plant Use, 1977-present.
- Working Group Member, IEEE 323 Electrical Equipment Qualification for Nuclear Plants, 1975-78.
- Liaison IEEE 387 Diesel-Generators for Nuclear Plant Use, 1980-present.

ANSI Memberships include:
- Rotating Synchronous Machinery (C50.10-14).
- Power Plant Motors (C50.19).

PUBLICATIONS:

IEEE 62-970 - Proper Motor Application Engineering Can Reduce Costs and Improve Reliability.
IEEE 70 CP 217 - Electrical Features of Avon Unit 9
Electrical World - 1973, Worlds First 345 KV SF6 Bus.