UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY LICENSING BOARD

In the Matter of	)	
	)	
SOUTH CAROLINA ELECTRIC AND GAS CO.	)	Docket No. 50-395 OL
	)	
(Virgil C. Summer Nuclear Station Unit 1)	)	

TESTIMONY OF EDWARD F. BRANAGAN, JR. REGARDING FAIRFIELD UNITED ACTION CONTENTION 13*

Q.1. Would you please state your name and place of employment.

A. My name is Edward F. Branagan, Jr. I am employed by the Nuclear Regulatory Commission in the Radiological Assessment Branch of the Division of Systems Integration. I have been employed in this position sincy 1979. My professional qualifications are attached to this testimony. (Attachment 1)

Q.2. Did you participate in the radiological review of the Summer Application?

A. Yes, as an environmental scientist.

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* Contention 13 states:

> The NRC and the Applicant have failed to comply with the requirement of NUREG-0694 (III.D.2.4) that 50 thermoluminescent dosimeters be placed around the site in coordination with the State and the Applicant. The Staff should be required to demonstrate that those TLDs are capable of accurately reading Co^{60}. By themselves, the TLDs are not adequate to provide emergency operations personnel with the information required to competently make the decisions required to reasonably assure the health and safety of the general public under accident conditions. Real-time monitors capable of reading gamma radiation levels should be required at the sites where TLDs are currently planned.

Q.3. Have you read Fairfield United Action Contention 13?

A. Yes.

Q.4. Are you prepared to testify to the substance of this contention?

A. Yes, in part. Contention 13 addresses four areas: (1) the adequacy of the number of thermoluminescent dosimeters (TLDs) around the Summer site; (2) the capability of the TLDs to measure exposure from Co^{60}; (3) the adequacy of TLDs to provide information to make decisions under accident conditions; and (4) the need for offsite real-time radiation monitors. I will address the first, second and fourth parts of this contention. The third part will be addressed in the testimony of Thomas Kevern.

Q.5. Could you please state the NRC Staff's position regarding the number of thermoluminescent dosimeters to be placed around the Summer site and the meaning of the numerical target outlined in NUREG-0694?

A. Certainly. Section III.D.2.4 of NUREG-0694 states:

> "The NRC will place approximately 50 thermoluminescent dosimeters (TLDs) around the site in coordination with the applicant and State environmental monitoring program."

The wording "approximately 50" indicates that the number of 50 is not to be regarded in an absolute sense. The general siting and placement criteria for the NRC TLD monitoring network is more fully described in U.S. NRC Inspection and Enforcement (I&E) Manual Appendix 1420, Part II, Section 2.0 (see Attachment 2). Basically, these NRC criteria require that approximately 50 TLD stations be installed at each site--covering all sectors of the compass, population centers, and high public interest locations out to a distance of about ten miles. The TLDs are to be located in two concentric rings at distances from the site of about 1-2 miles and about 3-5 miles. The actual number of TLD stations that are to be deployed depends upon the land use and topography of the particular site.

The NRC TLD monitoring network around the Summer Station is d scribed in enclosure 1 of a letter from J. P. Stohr, NRC Region II, to H. Shealy, Bureau of Radiological Health, South Carolina dated December 30, 1980 (see Attachment 3). As indicated in Attachment 3, the NRC's TLD monitoring network around the Summer Station meets the basic requirements of the I&E Manual Appendix 1420, Part II, Section 2.0 and, consequently, the requirements of NUREG-0694, Section II.D.2.4.

Q.6. Why are there less than 50 TLD monitoring stations around Summer?

A. The NRC criteria do not require that 50 TLD stations be installed at each site. If some ring sectors are not accessible, then the actual number of TLD stations that are installed will be less than 50. Eight of the inner ring sectors around the Summer Station are not accessible. By inaccessible we mean that the prospective ring sector was over water, in a swampy area or not near a road. However, the NRC's TLD monitoring network around the Summer Station meets the basic requirements of the I&E Manual.

Q.7. Do the TLDs in use around the Summer Station have the capability to accurately read Co-60?

A. Yes. The NRC TLD-Direct Radiation Monitoring Network uses the Panasonic TLD Model UD-800 Series. The manufacturers literature (Attachment 4) states that the Model UD-800 Series is capable of measuring X-rays and gamma-rays in the energy range of 10 KeV to approximately 10 MeV. Cobalt-60 emits two gamma rays (1.17 MeV and 1.33 MeV) that are well within the detection range of the Model UD-800 Series.

Q.8. What is the NRC Staff's position regarding the use of real-time radiation monitors?

A. The last part of Contention 13 alleges there is a need for offsite real-time radiation monitors. The NRC Staff's Branch Technical Position (Attachment 5) requires the licensee to place about 40 stations with two or more dosimeters or one instrument for measuring and recording the dose rate continuously around the site. The NRC Staff does not presently require offsite real-time radiation monitors for several reasons. First, radioactive effluent monitors are sufficiently accurate to provide emergency operations personnel with the necessary information for decisionmaking for monitored radioactive effluent releases. Real-time monitors would provide less reliable information during a monitored radioactive effluent release because of their distance from the release source. Second, the effectiveness of the real-time offsite monitors has not been demonstrated. It is the NRC Staff's position that more information is needed in several areas before a decision can be made to require real-time radiation monitors. The necessary information includes: (1) determination of the optimum number, placement and sensitivity of detectors; (2) evaluation of the accuracy of information displayed in the control room; and (3) analysis of the costs of the system versus the benefits gained.

Attachments:
1. Professional Qualifications
2. I&E Manual App. 1420, Part II, Sect. 20
3. Ltr frm J P. Stohr to H. Shealy, dtd 12/30/80
4. Panasonic Literature
5. Branch Technical Position

Professional Qualifications

My name is Edward F. Branagan, Jr. I am an Environmental Scientist with the Radiological Assessment Branch in the Office of Nuclear Reactor Regulation. Presently, I am responsible for evaluating the environmental radiological impacts from nuclear power reactors. In particular, I am responsible for evaluating radioecological models and health effect models for use in reactor licensing. I have been with the Radiological Assessment Branch for about 2 years.

I received a B.A. in Physics from Catholic University in 1969, an M.A. in Science Teaching from Catholic University in 1970, and a Ph.D. in Radiation Biophysics from Kansas University in 1976. While completing my course work for my Ph.D., I was an instructor of Radiation Technology at Haskell Junior College. My research work was in the area of DNA base damage, and was supported by a U.S. Public Health Service tranineeship. My dissertation was entitled "Nuclear Magnetic Resonance Spectroscopy of Gamma-Irradiated DNA Bases."

Since joining the NRC in 1976, I have been with both the Office of Nuclear Material Safety and Safeguards (NMSS), and with the Office of Nuclear Reactor Regulation (NRR). In NMSS I was involved in project management and technical work. I was the project manager for two contracts that the NRC had with Oak Ridge National Laboratory. These contracts were concerned with estimating radiation doses from radon-222 and radium-226 releases from uranium mills. As part of my work on NRC's Draft Generic Environmental Impact Statement on Uranium Milling (DGEIS), I calculated health effects from uranium mill tailings. Upon publication of the DGEIS, I presented a paper entitled "Health Effects of Uranium Mining and Milling for Commercial Nuclear Power" at a Conference on Health Implications of New Energy Technologies. Since joining NRR, I have worked on several projects: (1) managed and main author of a report entitled "Staff Review of 'Radioecological Assessment of the Wyhl Nuclear Power Plant'" (NUREG-0668), (2) served as a technical contact on an NRC contract with Argonne National Laboratory involving development of a computer program to calculate health effects from radiation, (3) served as a technical monitor on an NRC contract with Idaho National Engineering Laboratory involving estimated and measured concentrations of radionuclides in the environment; (4) served as a technical monitor on an NRC contract with Lawrence Livermore Laboratory concerning a literature review of values for parameters in terrestrial radionuclide transport models; and (5) served as a technical monitor with Oak Ridge National Laboratory concerning a statistical analysis of dose estimates via food pathways.

Presently, I am a member of the Health Physics Society and the American Association for the Advancement of Science.

APPENDIX 1420

PART II
TLD DIRECT RADIATION MONITORING NETWORK PROCEDURES

CONTENTS

2.0 ENVIRONMENTAL RADIATION MONITORING NETWORK SITING AND PLACEMENT CRITERIA

2.1 Nomenclature

Each site is considered to be the center of mass of a circle. The area of each circle is divided into sixteen standard windrose sectors each of 22.5° arc. The following is the sector identification table:

Sector Name	Azimuth*
N	348.75°-11.25°
NNE	11.25°-33.75°
NE	33.75°-56.25°
ENE	56.25°-78.75°
E	78.75°-101.25°
ESE	101.25°-123.75°
SE	123.75°-146.25°
SSE	146.25°-168.75°
S	168.75°-191.25°
SSW	191.25°-213.75°
SW	213.75°-236.25°
WSW	236.25°-258.75°
W	258.75°-281.25°
WNW	281.25°-303.75°
NW	303.75°-326.25°
NNW	326.25°-348.75°

*North - 0° and 360°, is defined according to the map system. Usually North will be either true north or grid north (TN or GN).

2.2 TLD Network Stations Within 5 Miles of the Plant Site

2.2.1 Around each site TLD network stations will be placed in two concentric rings beyond the licensee owner controlled property. For each ring one network station will be located in each windrose sector where appropriate. Dosimeter stations will not be placed in sectors which consist entirely of open water or unoccupied, inaccessible areas. The inner ring will be located beyond the licensee owner-controlled boundary out to 1-2 miles. The outer ring will be located 3-5 miles from the owner controlled boundary. In general, the low population zone boundary as defined in 10 CFR 100.3(b) will be included between the inner and outer rings of the TLD network.

These rings account for a maximum of 32 of 50 stations.

2.2.2 One TLD station will be located at the nearest residence. This is usually within 5 miles.

2.2.3 Within 5 miles, 5 stations should be placed side by side those of the licensee to allow for independent verification. These stations are part of the 32 accounted for in the two ring concept.

2.3 TLD Network Stations Beyond 5 Miles of the Plant Site

2.3.1 Up to 5 stations in population centers as defined in either the NRC's Final Environmental Statement (FES) or the licensee's Environmental Report.

2.3.2 Up to 4 stations at places of high public interest not already covered by the stations described in 2.3.1.

2.3.3 Three stations located at radial distances of 15-20 miles from the plant site in a predominantly up wind direction.

2.4 Low Background, In-Transit Control Station

One station as an in-transit control. This station will be located in an NRC provided lead cask. The dosimeter will remain in the cask at all times except when TLDs are in-transit to and from the NRC's Region I Office. No other materials (except other TLD in-transit control badges) may be placed in this cask. The cask shall be located in a well ventilated area away from sources of ionizing radiation.

2.5 Remaining Network Stations

The network described the above accounts for 46 of 50 possible locations. The remaining stations are to be placed as needed according to individual site characteristics.

2.6 Sector Coverage

When possible stations in the inner and outer rings described in 2.2 should be staggered with a given sector to maximize the probability of plume detection in the event of an airborne release of radioactive material.

2.7 Non-Routine Stations

The NRC may issue additional dosimeters for individual sites to be placed alongside routine stations to serve as one method of quality control.

2.8 Station Placement Under Accident Conditions

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2.9 Placement

2.9.1 General Directions

a. Attempt to place stations out of public view or reach. A suitable location would be a fenced enclosed electrical substation, a private residence, etc.

b. Place stations in areas which are readily accessible by automobile in all seasons. Avoid snowbound or flooded areas, for example.

c. Avoid shielding vegetation, terrain, or structures. Place dosimeters above natural ground cover.

d. Prior to final site selection, perform an area radiation survey with micro R/hr meter or equivalent. Placement should be away from areas in which radiation levels are greater than typical for the region.

e. In accordance with ANSI standards, dosimeter stations will be at 1 meter above ground level except where this placement would enhance the possibility of tampering or vandalism.

f. A photograph of the placement area will be made. Include where possible fixed identification landmarks. The photograph and negative will be supplied to the NRC's Region I Office.

2.10 Dosimeter Station

A typical dosimeter station will consist of one Model UD-801 badge containing four dosimeter elements. The badge is stored in the field in a heavy, rigid plastic mesh dosimeter cartridge - a right circular cylinder about 15 centimeters long and 6 centimeters in diameter. The cartridge will be mounted on telephone or pole equipment. The height above the ground will be 1 meter in accordance with the ANSI standard except where this height is likely to leave the station susceptible to vandalism.