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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY and NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY	)	Docket Nos. 50-400 OL 50-401 OL
	)	
(Shearon Harris Nuclear Power Plant, Units 1 and 2)	)	

AFFIDAVIT OF DR. WILLIAM H. WILKIE

County of Cobb)
) SS:
State of Georgia)

William H. Wilkie, being duly sworn according to law, deposes and says:

1. I am employed by Carolina Power & Light Company ("CP&L") as Principal Health Physics Specialist. My business address is Shearon Harris Energy & Environmental Center, Route 1, Box 327, New Hill, North Carolina 27562. A statement of my background and qualifications is affixed hereto as Attachment A. I have a Ph.D. degree in nuclear engineering from the Georgia Institute of Technology and extensive professional experience in the area of radiation protection in support of nuclear power operations. I have personal knowledge of the matters stated herein and believe them to be true and correct.

2. This affidavit supplements the affidavits of Thomas F. Timmons ("Timmons Affidavit"), Michael J. Hitchler ("Hitchler Affidavit"), Glenn E. Lang ("Lang Affidavit"), and Alan B. Cutter ("Cutter Affidavit") and is made in support of Applicants' motion for partial summary disposition of Joint Contention VII.

3. The purpose of this affidavit is to address that aspect of Joint Contention VII which concerns Applicants' ability to operate the steam generators to be used at the Harris Plant in a manner consistent with the As Low As is Reasonably Achievable ("ALARA") criterion. Joint Contention VII states in pertinent part that:

> Applicants have failed to demonstrate that the steam generators to be used in the Harris Plant are adequately designed and can be operated in a manner consistent with . . . ALARA exposure to maintenance personnel . . .

4. In this affidavit, I will:

a. verify Applicants' commitment to attaining the goals and objectives inherent in a sound ALARA program and in meeting the regulatory requirements of 10 C.F.R. Parts 20 and 50 pertaining to ALARA;

b. evaluate the radiological impact of the steam generator design modifications, the use of All Volatile Treatment ("AVT") water chemistry, and the use of a loose

parts monitoring system on maintenance personnel; and

c. show that the Joint Intervenors' claim that Applicants do not comply with the ALARA criterion is not supported by fact and is based on the erroneous belief that ALARA requires the elimination of <u>any</u> radiation exposure from the nuclear fuel cycle, regardless of how small.

Part A

5. Two basic conditions are considered necessary for an effective ALARA program: 1) the managers of both the utility and the nuclear facility should be committed to maintaining exposures as low as is reasonably achievable and 2) the personnel responsible for radiation protection should be continually vigilant for means to reduce exposure. <u>See</u> "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As is Reasonably Achievable," NRC Regulatory Guide 8.10 (1975). Section 12.1 of the Final Safety Analysis Report ("FSAR") for the Shearon Harris Nuclear Power Plant, attached hereto as Attachment B, describes Applicants' commitment to the principle of ALARA and summarizes the components of Applicants' program for implementing ALARA.

6. Based on my extensive experience in the radiation protection field prior to joining the CP&L organization and my

current knowledge of and involvement in the health physics program at CP&L, I can state unequivocally that the commitment of Applicants' management to the ALARA principle is genuine and that radiation protection personnel will maintain continual vigilance for means to reduce exposure. See Safety Evaluation Report related to the Operation of Shearon Harris Nuclear Power Plant, Units 1 and 2, NUREG-1038 (November 1983) ("SER") at § 12.1.

Part B

7. The Timmons Affidavit states, inter alia, that:

a. Due to the expansion of the steam generator tubes in the baffle-plate area and the bypass of 18% of the flow from the main to the auxilary feedwater nozzles, flow-induced vibration in the Model D-4 steam generators to be used at the Harris Plant will be minimized to the point where tube wear will not affect structural integrity so as to preclude operation at rated capacity. Timmons Affidavit at ¶¶ 19, 28;

b. The use of AVT water chemistry in accordance with the guidelines recommended by Westinghouse will minimize the potential for tube corrosion and cracking and will permit long-term integrity of the steam generators. Id. at ¶ 68.

8. The Hitchler Affidavit concludes that:

a. Tube failure due to wear from foreign objects in the Harris steam generators is judged to be much less likely than historical frequency indicates. Hitchler Affidavit at ¶ 21;

b. The operation of Model D-4 steam generators at the Harris Plant should result in a tube failure rate of less than 0.6×10^{-6}/tube-year. Id. at ¶ 27. (This corresponds to a probability of tube failure of less than once per 120 years of plant operation.).

9. The Cutter Affidavit verifies that CP&L:

a. has implemented Westinghouse Electric Corporation's ("Westinghouse") recommendations for design modifications to Model D-4 steam generators. Cutter Affidavit at ¶ 8;

b. will use AVT water chemistry and follow EPRI and Westinghouse guidelines related to the secondary side of the steam generators, insofar as they apply to the Harris Plant. Id. at ¶ 11;

c. has implemented design modifications to minimize the amount of copper corrosion products introduced into the feedwater

system, including installation of a full flow condensate polisher to remove copper corrosion products from the feedwater in accordance with Westinghouse guidelines. Id. at ¶ 21;

d. will employ Institute of Nuclear Power Operations ("INPO") recommendations [illegible] preclude the introduction of foreign material into the steam generators. Id. at ¶ 24;

e. will perform extensive testing and inspection during construction and operation to ensure that loose parts do not enter the reactor coolant system or secondary side of the steam generator. Id. at ¶¶ 25-28; and

f. will use a loose parts monitoring system designed by Westinghouse to ensure that any loose parts which might enter the steam generator system can be detected promptly and removed before causing damage. Id. at ¶ 30. See also Lang Affidavit.

10. To summarize the previous statements in the Timmons, Lang and Hitchler Affidavits, the modifications to and operation of the Harris steam generators are in accordance with recommendations of Westinghouse, INPO, and the Counterflow Steam Generators Owners Review Group, are approved by the NRC and

will result in a lower probability of steam generator tube failure. It follows directly that Applicants' intentions and actions related to the steam generators are fully consistent with a sound ALARA program because:

a. lower total collective doses are expected due to a decreased requirement for maintenance and personnel access to steam generators for inspection and removal of sludge and loose parts; and

b. individual doses are expected to be no greater than doses required for operating steam generators under conditions other than the ones currently recommended by Westinghouse and should, in fact, be substantially lower because of the need for less frequent entries by maintenance personnel into high radiation areas in or near steam generators or by reduced stay time per entry.

Part C

11. NRC regulations 10 C.F.R. Part 20.1(c) and Part 50.34a(a) state that:

> The term "as low as is reasonably achievable" means as low as is reasonably achievable taking into account the state of technology and the economics of improvements in relation to benefits to the public health and safety and other societal and

> socioeconomic considerations and in relation to the utilization of atomic energy in the public interest.

It is apparent that the ALARA concept must be applied in the context of cost-benefit issues related to the need for society to derive benefits such as the production of electric power from nuclear energy. Joint Intervenors, however, appear to read into the ALARA criterion the equivalent of an absolute bar to worker radiation exposure. This basic misconception of ALARA at the root of Joint Intervenors' allegations leads to incongruous results when applied in the context of actual plant operations. For example, Joint Intervenors suggest that the loose parts monitoring system may be inconsistent with ALARA because detection of loose parts may result in worker exposure to remove the loose part. The suggestion is inconsistent with a more reasoned position that recognizes the fact that undetected loose parts permitted to remain in the steam generator can lead to tube failure resulting in high dose repair work that could and should have been avoided. "Joint Intervenors' Response to Applicants' Sixth Set of Interrogatories (on Joint I and VII)," dated February 22, 1984 at Response to VII-21. Joint Intervenors' interpretation of ALARA ignores the concepts of what is practical, of what is economically feasible and what is in the public interest in light of the national policy decision to encourage the utilization of atomic energy.

12. In summary, the steps taken by Applicants, on the advice of Westinghouse and other authorities in the field, are

reasonably expected to improve the performance of the Westinghouse D-4 steam generators to be used at the Harris Plant. The necessary result of the design and program modifications set forth in detail in the Timmons, Lang and Cutter affidavits will be a lower frequency of repairs and maintenance procedures that entail radiation exposure to plant personnel. Thus Applicants' actions are consistent with the ALARA criterion which requires dose to be as low as is reasonably achievable.

William H. Wilkie

William H. Wilkie

Subscribed and sworn to
before me this 15th
day of May, 1984

My commission expires: Notary Public, Georgia, State at Large
My Commission Expires Jan. 5, 1987

Teresa B. Donovan

BIOGRAPHICAL DATA

DR. WILLIAM H. WILKIE

EDUCATION AND TRAINING

1967-1970	Georgia Institute of Technology, Atlanta, GA Nuclear Engineering/Biology/Radiological Physics Specialization Ph.D.
1960-1962	Vanderbilt University, Nashville, TN Physics/Mathematics/Health Physics Specialization M.S.
1957-1960	North Carolina State University, Raleigh, NC Nuclear Engineering/Engineering Mathematics B.S. (high honors) Graduate study one semester
1955-1957	Maryville College, Maryville, TN Mathematics/Physics (no degree)
1984	Chem-Nuclear Systems, Inc., Columbia, SC "Regulatory Awareness--Radioactive Waste Packaging, Transportation, and Disposal"
1979	Oak Ridge Associated Universities and Department of Energy, Oak Ridge, TN "Health Physics in Radiation Accidents"
1976	Institute for Advanced Technology, Washington, DC "Data Communications Systems"
1967	University of Tennessee, Knoxville, TN Biology
1962	Oak Ridge Institute of Nuclear Studies, Oak Ridge, TN "Advanced Radioisotope Technology"
1971-1981	Tennessee Valley Authority, Muscle Shoals, AL Numerous courses in computer training, management, systems development, etc.

CERTIFICATION

American Board of Health Physics

PROFESSIONAL ORGANIZATIONS

Health Physics Society

International Radiation Protection Association

BIOGRAPHICAL DATA

DR. WILLIAM H. WILKIE

PROFESSIONAL ORGANIZATIONS (cont.)

American Nuclear Society

Sigma Xi

HONORARY SOCIETIES

Phi Kappa Phi

Sigma Pi Sigma

Tau Beta Pi

EXPERIENCE Active in the field of health physics for 23 years)

1983- Carolina Power & Light Company, Raleigh, NC
Principal Health Physics Specialist

1981-1983 Electricity Supply Commission, Cape Town, South Africa
Regional Senior Health Physicist
Consultant

1971-1981 Tennessee Valley Authority, Muscle Shoals, AL
Staff Health Physicist

1970-1971 University of Pittsburgh, Pittsburgh, PA
Assistant Professor of Health Physics,
Graduate School of Public Health
Technical Director, Radiation Medicine Department,
Presbyterian-University Hospital

1968-1970 Technical Analysis Corporation, Atlanta, GA
Systems Development Engineer (part time)

1962-1967 Oak Ridge National Laboratory, Oak Ridge, TN
Research Associate

PREVIOUS CONSULTING

Radiological Assessment Systems for Nuclear Power

Technology for Energy Corporation

Oak Ridge National Laboratory

Advanced Research Corporation

BIOGRAPHICAL DATA

DR. WILLIAM H. WILKIE

BOOKS AND PUBLICATIONS

Wilkie, W. H., W. J. Millsap, and J. Walmsley, "Planning Bases for Radiological Emergency Response Near the Koeberg Nuclear Power Station," Escom Report, April 1983

"Operations Manual--Tygerberg Radiation Casualty Facility," Escom/Tygerberg Hospital Report, 1983

"Upgrading Environmental Radiation Data," USEPA Report EPA 520/1-80-012, August 1980

Wilkie, W. H., and M. S. Robinson, "Browns Ferry Nuclear Plant Emergency Dose Assessment Procedures for Atmospheric Releases of Radioactivity," TVA Report OHS-20-80-03, April 1980

Robinson, M. S., and W. H. Wilkie, "Browns Ferry Nuclear Plant Emergency Dose Assessment Procedures for Liquid Releases of Radioactivity," TVA Report OHS-20-80-04, April 1980

Wilkie, W. H., S. M. Nelson, and M. S. Robinson, "Technical Bases for Emergency Dose Assessment Procedures for Liquid Releases of Radioactivity," TVA Report OHS-20-80-06, May 1980

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Wilkie, W. H., and M. S. Robinson, "Sequoyah Nuclear Plant Emergency Dose Assessment Procedures for Atmospheric Releases of Radioactivity," TVA Report OHS-20-80-01, April 1980

Robinson, M. S., and W. H. Wilkie, "Sequoyah Nuclear Plant Emergency Dose Assessment Procedures for Liquid Releases of Radioactivity," TVA Report OHS-20-80-02, April 1980

"American National Standard for Internal Dosimetry for Mixed Fission and Activation Products," ANSI N343-1978

"The Tennessee Valley Region Study: Potential Year 2000 Radiological Dose to Population Resulting from Nuclear Facility Operations," DOE/ET-0064/2, June 1978

Garry, S. M., and W. H. Wilkie, "The Use of Environmental Monitoring Data in Determining Background Radiation Doses," Population Exposures, USAEC Report CONF-741018 (1974)

BIOGRAPHICAL DATA

DR. WILLIAM H. WILKIE

BOOKS AND PUBLICATIONS (cont.)

Wilkie, W. H., "The Interdisciplinary Nature of the Radiological Impact of Nuclear Plant Effluents on the Environment," Proceedings of TVA Task Force on Water Resources Research Meeting--The Growing Need for Interdisciplinary Research, 1974

Fish, B. R. and W. H. Wilkie, "The Fluid Dynamics of the Spherical Particle: (1) Tabulation of Settling Velocity, Reynolds Number, Drag Coefficient, Relaxation Time, and Acceleration-Distance in Air and Water," USAEC Report ORNL-TM-4100 (1973)

Wilkie, W. H., "The Spatial and Temporal Capture Distribution for Neutrons in a Coaxial, Two Medium, Liquid Scintillation Detection System," Advanced Research Corporation, Atlanta, GA, February 1970

"Biohazards of Aerospace Nuclear Systems, Final Report," T. G. Clark, B. R. Fish, W. H. Wilkie, J. L. Thompson, R. H. Boyett, and G. W. Royster, Jr., SC-CR-69-3291 (1969)

Wilkie, W. H., and D. S. Harmer, "Theoretical Modulation Transfer Functions and Dosimetry of Fast-Neutron Radiography," Biomedical Sciences Instrumentation-Volume 6, Instrument Society of America, Pittsburgh, PA (1969)

Wilkie, W. H., and B. R. Fish, "Scintillation Extrapolation Dosimetry of Small Beta-Emitting Sources," Solid State and Chemical Radiation Dosimetry in Medicine and Biology, IAEA, Vienna, Austria (1967)

"Environmental Studies: Radiological Significance of Nuclear Rocket Debris," (A series of reports involving classified research) USAEC Reports ORNL-TM-1053 (1965), ORNL-TM-1159 (1966), ORNL-TM-1686 (1966)

Wilkie, W. H., and R. D. Birkhoff, "Measurement of Spectral Distribution of Positron Flux in an Infinite Copper Medium Containing Cu-64," Phys. Rev., 135, A1133 (1964)

More extensive report on the positron research published as USAEC Report ORNL-3469 (1963)

12.1 ENSURING THAT OCCUPATIONAL RADIATION EXPOSURES ARE AS LOW AS REASONABLY ACHIEVABLE (ALARA)

12.1.1 POLICY CONSIDERATIONS

12.1.1.1 Corporate Health Physics Policy

In keeping with the policy of Carolina Power & Light Company (CP&L) to engineer, construct and operate nuclear power plants without jeopardy to public health and safety, it is the corporate policy of CP&L to develop, implement and maintain a sound health physics program at each CP&L facility which will maintain individual and total (man-rem) radiation exposures as low as reasonably achievable (ALARA). The health physics programs are structured to ensure that the exposure to radiation of CP&L personnel, contractor personnel, and the general public will be maintained at levels which are ALARA and consistent with Title 10 of the United States Code of Federal Regulations.

The goals and objectives of the health physics programs are to maintain the dose to individual facility personnel ALARA and to reduce the integrated dose to facility personnel (i.e., the sum of doses, expressed in man-rem, to all facility personnel). The health physics programs identify the participating organizations, the positions involved and the responsibilities and functions of the various positions in conducting the programs.

The design of nuclear facilities is consistent with the goals and objectives of the health physics programs. Design review involves consideration of the activities of facility personnel in areas such as operations, maintenance, refueling, inservice inspection, radioactive waste processing, decontamination, and radioactive waste disposal.

Properly trained personnel are provided to develop and conduct all necessary health physics programs. Health physics personnel possess the expertise necessary to carry out the health physics programs in an efficient manner, and to ensure that CP&L and regulatory requirements are met. Each CP&L employee and each contractor, working in a facility where exposure to radiation might occur, is required to make every reasonable effort to maintain radiation exposures and releases of radioactive materials to unrestricted areas as far below specified limits as reasonably achievable. Appropriate training programs, in the fundamentals of radiation protection and facility exposure control procedures, are established to provide instructions to all facility personnel, including contractors whose duties require unescorted access to radiation areas. Personnel who habitually or willfully disregard or violate health physics procedures and practices are subject to disciplinary action.

All CP&L health physics programs include procedures, job planning, record-keeping, special equipment and an operating philosophy conducive to meeting ALARA requirements. Proper preparation and planning is performed prior to entering radiation areas where significant doses could be received. Adequate supervision and radiation protection surveillance is provided, where necessary, during operations in radiation areas to ensure that the appropriate work practices and/or procedures are followed, planned precautions are observed, and potential radiation hazards which might develop during the

operations are considered in a timely manner. Results (i.e.man-rem) of work zones are analyzed to identify deficiencies in the program and to provide the basis for revising procedures, modifying facility features, or making other adjustments to reduce radiation exposures during subsequent activities.

Health physics facilities, instrumentation and protective equipment are provided to permit the staff to function safely and effectively. The selection and quantity of instrumentation and equipment are based upon the anticipated needs of the facilities during normal operations, major outages, and accident conditions.

5| The Manager of Corporate Health Physics periodically evaluates the various
health physics programs, as well as CP&L activities which relate to the
programs, and reports to senior management regarding the effectiveness and
5| adequacy of the programs. The Manager of Corporate Health Physics makes
recommendations to senior management as necessary, to maintain effective
5| overall health physics programs. The Manager of Corporate Health Physics
has the organizational freedom to communicate directly with the
President/Chief Executive Officer to resolve any concern in the area of
health physics if resolution is not possible at a lower management level.

12.1.1.2 Facility Management Policy

Carolina Power & Light Company has been committed, since the initial design phases of the Shearon Harris Nuclear Power Plant, to a program of keeping occupational radiation exposure as low as reasonably achievable (ALARA). The continuation of this policy during plant operations is another important management commitment. The Operating License, issued by the Nuclear Regulatory Commission, carries with it an obligation to both workers and the general public to maintain exposures as low as is reasonably achievable, considering costs and expected benefits. Carolina Power & Light Company plans to follow the general guidance of Regulatory Guides 1.8, 8.8, and 8.10, and publications which deal with ALARA concepts and practices, including Title 10, Code of Federal Regulations, Part 20. As discussed in Section 12.1.1.1, corporate management has formally committed itself to these concepts by issuing and endorsing the Corporate Health Physics Policy, which ensures compliance with all state and federal regulations that pertain to the safe operation of nuclear power plants.

The implementation of this Corporate Health Physics Policy is accomplished
through a number of mechanisms and procedures in all stages of plant design,
construction and operation. During the plant operational and continued
construction period, the Nuclear Operations Department's Radiation Control
5| and Protection Manual provides the direction necessary for implementing
corporate policy.

The Radiation Control and Protection Manual sets forth the basic philosophy and general radiation protection standards and procedures that are essential to the safe operation of CP&L's nuclear facilities. The manager of each nuclear facility is responsible for ensuring that the requirements of this manual are included in the Radiation Control and Protection Manual at that facility. The Radiation Control and Protection Manual for the SHNPP facility is a volume of the Facility Operating Manual, and is approved by the General Manager.

The primary purposes of the Radiation Control and Protection Program are to provide personnel with a safe environment in which to work, to protect the general public and the off-site environs, and to establish procedures and a system of records to meet all the requirements of applicable regulations.

Effective control of radiation exposure involves the following major considerations:

a) Management commitment to, and support of, the Radiation Control and Protection Program,

b) Careful design of facilities and equipment to minimize radiation exposure during operation and maintenance,

c) Good radiation protection practices, including good planning and the proper use of appropriate equipment by qualified, well-trained personnel.

The management of CP&L is firmly committed to performing all reasonable actions for ensuring that radiation exposures are maintained ALARA.

Section 12.1.2 and Section 12.3 discuss the ALARA considerations that have been incorporated into the design of the Shearon Harris Nuclear Power Plant. The facility will be operated and maintained in such a manner as to ensure that occupational radiation exposures are ALARA. Training programs have been established to ensure that personnel understand both why and how occupational radiation exposures will be maintained ALARA.

12.1.1.3 Facility Management Responsibilities

Management's commitment to the Corporate Health Physics Policy is reflected in the design of the plant, the careful preparation of plant operating and maintenance procedures, the provision for review of these procedures and for review of equipment design to incorporate the results of operating experience, and most importantly, the establishment of an on-going training program. Training is provided for personnel, so that each individual will be capable of carrying out his responsibility for maintaining his own radiation exposure, as well as that of others, ALARA consistent with discharging his duties. The development of a proper attitude and an awareness of the potential problems in the area of health physics, is accomplished through proper training of all plant personnel.

The responsibility for implementation of the ALARA program resides with the plant General Manager, with primary support from the Manager, Environmental and Radiation Control and the radiation control staff (see Figure 12.1.1-1). The Manager, Environmental and Radiation Control reports to the Manager, Plant Operations and makes recommendations to plant management concerning the most effective radiation exposure reduction methods. He is assisted in this task by the Radiation Control Supervisor and Radiation Control Specialists. A Radiation Control Specialist is designated as the ALARA Specialist. The ALARA Specialist includes as a major portion of his assignment, an analysis of plant operations with respect to maintaining an ALARA approach to personnel radiation exposure. 11

The success of the ALARA program depends upon cooperation between many plant operating groups. The ALARA Specialist acts as a liaison between these groups while maintaining a high degree of organizational freedom. An ALARA Committee, composed of an individual from each major plant operating group and chaired by the ALARA Specialist, will handle plant worker's suggestions for reducing radiation exposure, ensure interface with various plant groups, and provide a mechanisim for the review of outages and maintenance activities.

The Radiation Control Supervisor reports to the Manager, Enviromental and
5 Radiation Control and provides in-plant radiation protection activities on a day to day basis. He is assisted by the Radiation Control Foremen and a technician staff.

The overall effectiveness of the program is reviewed periodically by appropriate plant and corporate management personnel. Written guidance and procedures have been developed by which the program can be assured. Included in the formal guidance is the Nuclear Operations Department Radiation Protection and Control Manual (discussed in Section 12.1.1.2) and a written ALARA program. The Technical Services Department provides formal support for the plant's ALARA program through the Radiological and Chemical Support Section.

The main goals of an ALARA program are to maintain both individual radiation doses and collective radiation exposures ALARA through the use of improved equipment, procedures, and work practices. The first step in achieving this goal is to identify the major radiation exposure areas (such as maintenance, radwaste handling, routine surveillance, in-service inspections, and refueling). An analysis of the most beneficial radiation exposure reduction methods is then performed. For external radiation exposure, the following principles are applied as needed to reduce radiation exposure: reduction of time spent in radiation fields, increasing distance from radiation sources, and provision of adequate shielding from the sources of radiation. The control of internal radiation exposure involves the use of process and engineering controls; a respiratory protection program is in effect in instances where such controls are not practical or adequate.

Proper and timely review of plant procedures and modifications is vital for averting potential, unwarranted personnel radiation exposures. The use of specific procedures, preplanning, and practice-with-mockups may be used to reduce radiation exposure for a particular job. After completion of work in radiation areas, actual radiation exposures are evaluated and can be compared to predicted exposures. Radiation exposure can be trended and analyzed for use in planning future work procedures and techniques.

12.1.1.4 Policy Implementation

The management's ALARA policy is implemented at the Shearon Harris Nuclear Power Plant by the Radiation Control Staff under the direction of the Manager, Environmental and Radiation Control. The operational ALARA considerations
5 identified in Sections 12.1.3 and 12.5.3.2 are incorporated in plant procedures.

A training program will be established to give appropriate plant personnel the knowledge necessary to understand why and how they should maintain their occupational radiation exposure ALARA.

12.1.1.5 ALARA Program Implementation Components

The Plant Management's responsibilities for implementation of corporate policy include:

a) Ensuring that an effective measurement system is established and used to determine the degree of success achieved by plant operations with regard to the ALARA goals and objectives,

b) Ensuring that the measurement system results are reviewed on a periodic basis, and that corrective action is taken when attainment of the specific objectives appears to be jeopardized,

c) Ensuring that the authority for providing procedures and practices, by which the specific goals and objectives will be achieved, is delegated, and

d) Ensuring that the resources needed to achieve ALARA goals and objectives are made available.

The Radiation Protection program is based on regulations and personnel experience including or considering the following:

a) Detailed procedures are prepared and approved for radiation protection prior to plant operation. Those procedures are a part of SHNPP's radiation protection program. 11

b) Radiological incidents are thoroughly investigated and documented in order to mitigate the chance for recurrence. Reports are made to the NRC, in accordance with 10CFR20.403 and 10CFR20.405 and the Technical Specifications.

c) Periodic radiation, contamination, and airborne activity surveys are performed and recorded to document radiological conditions. Records of the surveys are maintained in accordance with 10CFR20.401.

d) Radiation and high radiation areas are defined and identified in accordance with 10CFR20.202 and 10CFR20.203 and the Technical Specifications. Airborne radioactivity is determined and posted in accordance with 10CFR20.201 and 10CFR20.203. Positive control is exercised for each individual entry into high radiation areas.

e) Access control points are established to separate potentially contaminated areas from uncontaminated areas of the plant.

f) Radiation work permits (RWP) are issued for certain jobs in accordance with the plant's Radiation Protection program. Jobs involving significant radiation exposure to personnel are preplanned to the maximum extent practicable. Emphasis is placed upon the use of mock-ups, plant's special tools, and temporary shielding.

g) Protective clothing is used as required by the plant's Radiation Protection program to help prevent personnel contamination and the spread of contamination from one area to another.

h) Personnel are provided with personnel radiation monitoring equipment to measure their radiation exposure, in accordance with 10CFR20.202 and the
5 plant's Radiation Protection program.

i) Process radiation, area radiation, portable radiation, and airborne radioactivity monitoring instrumentation are periodically calibrated, as
5 established in the plant's Radiation Protection program.

j) Tools and equipment used in controlled areas are surveyed for
5 contamination before removal to an uncontrolled area. Contaminated tools and equipment, which are removed from a controlled area, will be packaged as necessary to prevent the spread of contamination to uncontrolled areas.

k) A bio-assay program (presently being developed) is included as part of
5 the plant's Radiation Protection program. This program includes whole body counting and/or excreta sampling to measure the uptake of radioactive material. The program will meet the intent of ANSI Standard N343-1978.

l) Records of occupational radiation exposure are maintained and reports are made to the NRC, as required by 10CFR20.407 and 10CFR20.408, and to individuals, as required by 10CFR19.13.

m) An environmental radiological monitoring program measures any
5 effect of plant radioactive releases to the surrounding environment.

5 n) All radioactive effluent pathways from the plant are monitored, and records are maintained.

o) All incoming and outgoing shipments which may contain radioactive material are surveyed to assure compliance with 10CFR71, 10CFR73, and 49CFR-190 and other relevant regulations.

12.1.2 DESIGN CONSIDERATIONS

The extensive design effort expended upon SHNPP will contribute greatly in reducing occupational radiation exposures to the plant staff and offsite contractors. Radiation protection design considerations included shielding of radioactive components, ventilation system improvements, equipment design and selection with emphasis upon safety, reliability and maintainability, equipment layout and access, provisions for remote operations and system flushing, facility design to allow ease of component removal, movement to decontamination facilities and repair facilities, as well as numerous innovative design features and equipment additions which have been included in the plant to improve operability and minimize personnel radiation exposure.

The SHNPP radiation protection design considerations are based upon a practical approach for maintaining occupational radiation exposure (ORE) ALARA. This approach, which is based upon the corporate policy previously discussed, is used by establishing and implementing a set of radiation protection design goals. These goals were determined according to conservative and practical criteria in facility and equipment design, experience from past designs and operating plants incorporated to improve the present SHNPP designs and mechanisms and procedures established to ensure design reviews not only by ystem and component designers, but also by personnel experience in radiation protection.

The present plant design incorporates the applicable guidance of Regulatory Guide 8.8. This design effort, which preceded this regulatory guide, established a formal design guide for the Architect/Engineer (A/E) based upon CP&L experience and commitment to keeping ORE ALARA. Numerous dose assessment studies and evaluations were performed in designing plant systems, especially in areas where new technology was utilized. A discussion of specific design features is provided in Section 12.3.1.

Although features have not been incorporated into the design of the SHNPP specifically for ensuring that occupational radiation exposures will be ALARA during decommissioning, many of the inherent design features and policy considerations to ensure that occupational radiation exposures will be ALARA throughout the operating life of the plant are also applicable during the eventual decommissioning of the plant. 5

12.1.2.1 Radiation Protection Design Goals

The SHNPP radiation protection design goals ensure compliance with the standards for radiation protection specified in 10CFR20. General design goals utilized to keep in-plant radiation exposures to ALARA levels include:

a) Minimizing the necessity for and amount of personnel time spent in radiation areas; and,

b) Minimizing radiation levels in routinely occupied plant areas and in the vicinity of plant equipment expected to require personnel attention.

The following methodology for implementing the design goals was used to the extent practicable as a basis for maintaining occupational radiation exposures ALARA:

a) Establish design dose rates and airborne concentration limits for general access areas based upon CP&L experience and 10CFR20 regulations,

b) Determine the most severe radiological mode of operation for each piece of equipment and section of pipe,

c) Based upon source terms, determine the source for each piece of equipment, pipe, and general area,

d) Determine shielding and ventilation requirements to maintain design dose rate(s) and airborne concentration limits, respectively,

e) Determine advantages and disadvantages of equipment location, orientation, and segregation,

f) Use predetermined guidelines and criteria for locating piping and penetrations and design of the ventilation system,

g) Implement changes in design, including choice of equipment, wherever practicable to achieve ALARA exposures.

Both equipment and facility designs are considered in keeping exposures ALARA during plant operations, including normal operation, maintenance and repairs, refueling operations and fuel storage, in-service inspection and calibrations, radioactive waste processing, handling and disposal, and other events of moderate frequency. The actual design features used are described in 12.3.1.

12.1.2.2 General Design Considerations for ALARA Exposures

The SHNPP radiation protection design goals are expanded to the total plant design objectives. These objectives are categorized into several radiation protection concerns, which are described in the following subsections. Plant layout considerations include direct radiation (scattered and direct gamma rays and/or neutrons from nonairborne radiation sources(s)), and ventilation considers airborne radioactivity (see Section 12.2.2).

The design objectives reflect the operating experience at the H. B. Robinson Unit 2 and Brunswick Steam Electric Plant to obtain an improved design.

12.1.2.2.1 Plant Layout and Shielding

The SHNPP layout is based upon a number of considerations including personnel access for ease of maintenance and operations. The location of important features such as decontamination facilities, equipment access hatches, equipment laydown and work areas, and maintenance shops were established with emphasis given to keeping operational radiation exposure ALARA.

Plant facilities' general design considerations to minimize the amount of personnel time spent in a radiation area include:

a) Whenever practicable, locating equipment and instruments (which will require routine maintenance, calibration, or inspection), for ease of access and a minimum of required occupancy time in radiation fields,

b) Where practical, arranging plant areas to allow remote or mechanical operation, service, monitoring, or inspection of highly radioactive equipment,

c) Providing, where practicable, for transportation of equipment or components requiring maintenance or repair to a lower radiation area,

d) Whenever practicable, provide for removal of equipment from the plant without requiring removal of HVAC duct work, piping and surrounding support structural members

e) Providing rigging and scaffolding insert plates to minimize problems with equipment removal

f) Providing removable block walls or easily removable floor or wall plugs to minimize the radiation exposure in gaining access to highly radioactive components when removal (e.g., tube pulling) is required

Plant general design considerations provided to minimize radiation levels in plant access areas and in the vicinity of equipment requiring personnel attention include:

a) Separating radiation sources and occupied areas, where practicable

b) Locating equipment, instruments, and sampling stations, in the lowest practicable radiation zones

c) Providing means and adequate space for using portable shielding

d) Providing means to control contamination and to facilitate decontamination of potentially contaminated areas

In conjunction with the plant and equipment layout, shielding was arranged and designed according to the following objectives:

a) A sufficient quantity of access paths (general access areas) are furnished to allow personnel access to equipment

b) Sufficient shielding is provided to control the levels of radiation present in a general access area.

c) Radiation areas are classified into zones according to expected (maximum) radiation levels.

d) Shielding is provided to accommodate equipment removal and maintenance.

12.1.2.2.2 Ventilation

The plant's ventilation systems are designed to provide heat removal and control of airborne radioactivity. Ventilation systems are designed to direct the airflow from areas of low airborne radioactivity to areas of higher airborne radioactivity. The ventilation systems are described in greater detail in Section 9.4. The radiation protection aspects of the systems are discussed in Section 12.3.3.

12.1.2.2.3 Health Physics

The radiation protection design objectives for health physics are met by the following:

a) The applicable 10CFR20 limits are maintained for operating personnel and the general public,

b) The plant's radiation monitoring equipment is designed to detect and annunciate excessive airborne radioactivity and high radiation levels,

c) Personnel radiation monitoring equipment is provided to measure and record personnel radiation exposure,

d) Periodic radiation surveys are performed when required,

e) Access to radioactive contaminated equipment is designed so that, with properly trained personnel, radiation exposures during all modes of plant operation meet the ALARA requirements,

f) Cleaning and decontamination facilities are provided for equipment and protective clothing,

g) Radioactive fluids (liquids and gases) are contained and controlled to keep the release of radioactive materials to general access areas and the environment ALARA,

h) Radioactive effluent release paths to the environment are monitored and facilities for analysis of radioactive samples are furnished, and

i) The 10CFR50 Appendix A, Criteria 19, limits for the Control Room are met for a design-basis accident and lesser accidents.

12.1.2.3 Improvements in Facility Design Due to Past Experience and Operation

Carolina Power & Light Company operates two licensed General Electric BWR's and one Westinghouse PWR. The operating experience obtained from these plants has been incorporated into the design of SHNPP. In addition, published information on radiation problems and radiation protection is used to anticipate and minimize occupational radiation exposure. During plant design, operating reports and data such as that given in WASH 1311, NUREG-75/032, NUREG-109, and AIF paper "Compilation and Analysis of Data on Occupational Radiation Exposure Experienced at Operating Nuclear Power Plants" September 1974, References 12.1.2-1 through 12.1.2-4 respectively, were reviewed to determine which operations, procedures or types of equipment were most significant in producing personnel exposures. Experienced operating personnel have continually reviewed the plant design as the design progressed, and have provided recommendations based on their experience.

Prior to the initial promulgation of Regulatory Guide 8.8, several meetings were held between CP&L engineering and operating personnel and Ebasco personnel (Architect/Engineer) responsible for the radiation protection design of SHNPP to discuss ways of improving the design. These meetings culminated in tours of the H. B. Robinson (HBR) Unit 2 operating plant. First hand knowledge was gained of the design and operating features which could be readily improved in the SHNPP to keep radiation exposures ALARA. Further information related to inspection, maintenance, and repair times and radiological hazards has been given to Ebasco so that such information could be factored into the plant layout features, systems design, and estimate of radiation exposures to personnel.

The initial result of these meetings and information exchange was the issuance of a set of guidelines for the design of the SHNPP to minimize personnel radiation exposures. These guidelines were prepared by Ebasco radiation protection engineers and were reviewed and approved by CP&L's cognizant health physics and operating personnel.

The guidelines were then issued to all designers and engineers involved in the SHNPP design effort, and the adherence to the guidelines was and is monitored by the radiation protection engineers. Additional design feedback has continued throughout the project.

It is significant to note that these guidelines, summarized in Section 12.3, paraphrase to a large extent Regulatory Guide 8.8 even though they preceded it. The guidelines have since been updated to reflect Regulatory Guide 8.8.

Review of the radiation protection design is a continuing process throughout all phases of the design. Ebasco's radiation protection personnel work side by side with the other disciplines' engineers and designers to ensure that all necessary radiation protection considerations have been taken into account.

Listed below are examples of some of the many design changes and improvements:

a) The Waste Processing Building has been continually upgraded. In each instance, one of the major considerations for the upgrade was the addition of space for equipment designed to segregate wastes, thereby limiting the high radioactivity to isolated systems, making wastes easier to shield, and providing more space for pipe chases, valve and pump galleries, remote valve operating stations, and sampling stations. Where possible, each tank, valve, pump, and system has been arranged so that work on valves and pumps can be accomplished with a minimum of exposure from other portions of the same system. Even after the last complete upgrade, efforts have continued to improve the radiation protection features.

In the waste gas compressors and catalytic hydrogen recombiners area, the valve galleries were rearranged and labyrinths added to reduce the exposure doses. In the filter backwash area new walls were added to provide shielding labyrinths. New shielding labyrinths were provided for floor drain pumps. In the same area, roofs were added to provide shielding for the hot lines going from the sumps to the pipe tunnel.

b) Backflushable filters have been installed instead of the conventional cartridge filters so that there would be virtually no requirement for filter handling with the concomitant radiation exposures. This was the result of an extensive close assessment of operating PWR experience with cartridge filters. Similar evaluations have been performed for other equipment.

c) The drumming station has been designed for automatic operation with a minimum of operator exposures.

d) In the heat exchanger area of the Reactor Auxiliary Building, the piping has been rerouted to arrive at a configuration resulting in less potential personnel exposure. From a design which had most of the piping routed in the valve galleries, the configuration has changed to one in which the piping runs mostly in shielded chases.

e) Shielding walls have been provided for equipment which is expected to be rarely, if ever, radioactive, to ensure protection against such an eventuality. An example for which shielding walls have been provided is the boric acid tanks.

f) Carolina Power & Light Company developed a state-of-the-art concept for radiation monitoring which allows a computer based system to monitor all remote radiation monitor devices without requiring personnel access. This concept has been adopted by over a dozen other utilities. The bases for this design effort was CP&L's previous experience with such equipment and the desire to improve health physics coverage.

Carolina Power & Light Company's Nuclear Power Plant Engineering Department reviews and approves the Ebasco recommendations resulting from the above design review process. When necessary, the Nuclear Power Plant Engineering Department consults with other organizations within or outside CP&L.

Routine survey data from CP&L's operating plants continue to be reviewed to improve the design of SHNPP. Additional examples of how CP&L's experience has contributed to the SHNPP design can be found in Section 12.3.

12.1.2.4 Equipment Design Considerations

Radiation protection general design consideration for equipment include shielding, equipment access, equipment selection, and equipment maintenance. Equipment design objectives deal with access to, and segregation of, radioactive equipment. Equipment design objectives for radiation protection include:

a) Reliability, durability, construction, and design features of equipment, components, and materials to reduce the need for repair or preventive maintenance,

b) Servicing convenience including ease of disassembly and modularization of components for replacement or removal to a lower radiation area for repair,

c) Provisions, where practicable, to remotely or mechanically operate, repair, service, monitor, or inspect equipment, and

d) Redundancy of equipment or components to reduce the need for immediate repair when radiation levels may be high and when no feasible method is available to reduce radiation levels.

Equipment general design considerations directed toward minimizing radiation levels proximate to equipment or components requiring personnel attention include:

a) Equipment which processes fluids with low radioactivity are located in separate cubicles from equipment which processes highly radioactive fluids,

b) Hatches are provided as needed to allow access to equipment from the top,

c) Equipment is located in accessible parts of cubicles; equipment frequently changed in whole or in part is readily accessible,

d) Hoists or lifting lugs are provided, as needed, for equipment servicing, maintenance, and removal,

e) Provision for isolating draining, flushing, or, if necessary, remote cleaning of equipment containing radioactive material,

f) Design of equipment layout, piping runs, and location of valves to minimize the buildup of radioactive material and to facilitate flushing of crud traps,

g) Utilization of high quality valves, valve packings, and gaskets to minimize leakage and spillage of radioactive materials, and

h) Provisions for minimizing the spread of contamination into equipment service areas including direct drain connections.

12.1.2.5 Equipment Selection

The selection of equipment to handle and process radioactive materials is based upon system requirements and radiation protection requirements. Consideration is given to minimizing leakage, spillage, and maintenance. Material and coating selection are chosen for decontamination properties as well as durability. Some components which may become contaminated are designed with provisions for flushing or cleaning. Reduced occupational radiation exposure is attained by utilizing operating experience and where practical, providing prudent equipment selections such as:

a) Diaphragm seal valves which require no packing,

b) Longer-lived graphite-filled packing, instead of standard packing,

c) Remote systems (or connections) for remote chemical cleaning where practicable,

d) Crossties between redundant equipment and/or related equipment capable of redundant operation to allow removal of contaminated equipment from service,

e) Air connections to tanks containing spargers to allow for air injection to uncake contaminates,

f) Backflushable filters to eliminate handling of spent cartridge filters,

g) Pumps with flanged connections to allow quick removal and installation, and

h) Remote drumhandling equipment for radwaste packaging.

12.1.2.6 Overall Impact of ALARA Exposure Design Considerations

Carolina Power & Light Company has given extensive attention to maintaining occupational radiation exposure ALARA at SHNPP. The design of the plant facilities, equipment, structures, and access areas is based upon a corporate commitment to minimizing radiation exposure and has been implemented, as practicable, in all aspects of the design. Consideration has been given to routine operations, transient operations, operational occurrences, maintenance, refueling, radioactive waste processing and disposal, and abnormal occurrences and accidents.

The SHNPP design takes into account equipment removal, decontamination, ventilation, orientation of equipment, in situ calibration and maintenance, sampling, monitoring, shielding, controlling contaminated fluids, minimizing leakage and spillage, and radiation exposure.

The design philosophy established for SHNPP strives to maintain occupation radiation exposure ALARA and is in compliance with applicable regulations.

12.1.3 OPERATIONAL CONSIDERATIONS

Operational considerations at SHNPP that promote the ALARA philosophy include the determination of the origins of radiation exposures, the proper training of personnel, the preparation of radiation protection procedures, the development of conditions for implementing these procedures, and the formation of a review system to assess the effectiveness of the ALARA philosophy.

Efforts are made to factor operational considerations of radiation exposure | 5
in the plant layout and system design, by utilizing the guidelines of Section 12.1.2 throughout the design effort. These guidelies incorporate known operational considerations derived from experience. Information from operating plants has continuously been factored in the design as it progressed to reflect new operational considerations.

The Manager, Environmental and Radiation Control and staff working closely with | 5
other departments review and study plant systems such as the NSSS, the radioactive waste management systems, the Residual Heat Removal System, the Spent Fuel Pool Cooling and Cleanup System, and other systems that collect, store, contain, or transport liquid, gaseous, or solid radioactive material. Objectives are to understand the functional aspects of each system, to identify the origins of radiation exposures in the plant, and to know and identify these exposure origins by location, operation, and job category.

Operational radiation protection objectives deal with access to radiation areas, exposure to personnel, and decontamination. Working at or near highly radioactive components requires planning, special methods, and criteria directed toward keeping occupational radiation exposure ALARA. Job training and debriefing following selected high exposure jobs contribute toward reduced exposures. Decontamination also helps to reduce exposure. Procedures and techniques are based upon operational criteria and experience that have worked to keep radiation exposure ALARA.

12.1.3.1 Operational Objectives

The operational radiation protection objectives are met by methods that include the following:

a) Knowledge of plant systems,

b) Experienced personnel to direct and train other personnel,

c) Use of periodic radiation surveys,

d) Use of radiation monitoring equipment to detect airborne radioactivity concentrations and high radiation levels and to measure and record personnel radiation exposure,

e) Analysis of radioactive samples to monitor chemistry and check for radiation release,

f) Use of cleaning and decontamination facilities for equipment and protective clothing,

g) Detailed job planning for high exposure work,

h) Job simulations to improve productivity on the job, thereby keeping exposure ALARA,

i) Briefings after selected high-exposure jobs to identify time consuming work and to identify problems, and

j) Improving procedures and techniques for future jobs.

12.1.3.2 Procedure Development

Plant procedures are prepared, reviewed, and approved in accordance with Section 13.5.

12.1.3.2.1 ALARA Procedures

To assure adequate emphasis on the necessity to minimize personnel exposures,
ALARA procedures are prepared as a sub-category of health physics procedures.
The health physics procedures, prepared and written by the Radiation Control
5 Group, emphasize acceptable health physics techniques and methods. The ALARA
procedures implement considerations of such topics as ALARA training, ALARA
review of applicable Radiation Work Permits (RWP), worker feedback, special task
training and evaluation of proposed changes in applicable facilties or equipment.
ALARA procedures provide the necessary basis for instruction of plant personnel
in the mechanisms available to minimize personnel radiation exposures. Health
physics procedures incorporate guidance from Regulatory Guides 8.8 and 8.10, and
CP&L guidelines and criteria. A description of the health physics procedures for
SHNPP is presented in Section 12.5.3.

12.1.3.2.2 Plant Procedures

Administrative requirements are implemented to assure that applicable procedures developed by other plant disciplines have adequately incorporated the principle of minimizing personnel radiation exposure. Plant administrative documents describe the criteria of selection of those procedures and revisions that are reviewed by health physics personnel. Recommendations made by health physics personnel will normally be resolved with the appropriate plant discipline prior to submission for final review, approval and implementation.

12.1.3.2.3 ALARA Techniques

In order to control radiation exposure to individuals, a Radiation Work Permit (RWP) is required whenever work involving a significant radiation exposure or radioactive materials is performed as specified in the following situations:

a) Entry into any area where radiation levels are in excess of 100 mrem/hr.,

b) Any maintenance work which involves opening of any system which contains, or could potentially contain, radioactive fluids, or

c) Any maintenance of contaminated or potentially contaminated equipment using methods involving abrasion, cutting, machining or welding.

Job preplanning, training and RWP requirements ensures that the SHNPP's ALARA policy is fulfilled. Techniques that may be used include:

a) Temporary shielding, such as lead sheets or blankets draped or strapped over pipes or pieces of equipment are used; temporary shielding would only be used if total exposure, which includes exposure received during installation and removal of the shielding, will be effectively reduced.

b) As much as practicable, jobs are performed outside radiation areas. This includes items such as reading instruction manuals or procedures, adjusting tools or jigs, repairing valve internals and prefabricating components.

c) For long-term repair jobs, consideration is given to setting up communication and closed-circuit television to assist supervising personnel in checking on work progress from a lower radiation area.

d) Entry and exit control points are established in areas with low levels of radiation. This limits the exposure of personnel that are changing protective equipment and generally preparing to work in radiological control areas. The access control points are set up to limit the spread of contamination from the work areas to as small an area as practicable.

e) Protective clothing and respiratory protection are selected to minimize the discomfort of workers so that efficiency is increased and less time is spent in radiation areas.

f) Personnel are assigned self reading dosimeters to allow determination of accumulated exposure at anytime during a work assignment in high radiation areas.

g) On intricate jobs, especially those which involve high or complex radiation levels, the job preplanning includes estimates of the man-rem needed to complete the job. At the completion of the work, a debriefing session is held with the personnel that performed the work (when practical) in an effort to determine how the work could have been completed more efficiently and with less radiation exposure.

12.1.3.3 Implementation of Procedures and Techniques

The criteria or conditions under which various operating procedures and techniques for ensuring that occupational radiation exposures are ALARA for systems asociated with radioactive liquids, gases, and solids, along with the means for planning and developing procedures for radiation exposure-related operations, are given in the following:

a) Section 12.1, Ensuring that Occupational Radiation Exposures are ALARA

b) Section 12.3, Radiation Protection Design Features

c) Section 12.5, Health Physics Program

d) Section 13.5, Plant Procedures

The implementation of the ALARA philosophy is directed by the Radiation
5 Control Supervisor on a day to day basis. In the review and approval of those plant procedures that include the potential for radiation exposure, appropriate health physics procedures are referenced in the plant procedures to ensure that any radiation exposure is maintained ALARA. Entrance to the restricted areas at SHNPP is controlled by the Environmental and Radiation
5 Control Group, and may require the issuance of a Radiation Work Permit. The description of the permit system is discussed in Section 12.5.3. When the permit is initiated, the work assignment and applicable procedures may be listed. As determined on a case-by-case basis, additional health physics procedures can be implemented at this time if needed.

The health physics training program will help implement the SHNPP's ALARA policy. The training program assures that workers understand how radiation protection relates to their jobs and all workers will have opportunities to discuss radiation safety with the radiation control personnel when the need arises.

Training and RWP requirements ensures that the Company's ALARA policy is fulfilled.

12.1.3.4 Plant Organization

As described in Section 12.5.1, the plant organization provides the Manager,
5 Environmental and Radiation Control access to the General Manager through the Manager of Plant Operations. This organization will allow the Plant General Manager involvement in the review and approval of specific ALARA goals and objectives as well as review of data and dissemination of information related to the ALARA program.

The organization also provides the ALARA Specialist, who is normally free from routine health physics activities, to implement the plant's ALARA program. This individual is primarily responsible for coordination of plant ALARA activities and will routinely interface with first line supervision in radiation work planning and post job review.

12.1.3.5 Operating Experience

The Radiation Work Permit process described in Subsection 12.5.3 provides a mechanism for collection and evaluation of data relating to personnel radiation exposure. Information collated by systems and/or components and job function assists in evaluating design or procedure changes intended to minimize future radiation exposures.

The Manager, Environmental and Radiation Control is responsible for the review of radiation exposure records, investigating not only the individual exposures, but the exposures as classified by job description and job location. Information

obtained from this review will be compared with radiation exposure results from past experience and with data obtained from average exposure results from other plants to assess the effectiveness of the ALARA effort at SHNPP.

12.1.3.6 Exposure Reduction

Specific radiation exposure reduction techniques that are used at SHNPP are described in Section 12.5.3. Procedures assure that applicable plant activities are completed with adequate preparation and planning; work is performed with appropriate health physics recommendations and support; and results of post-job data evaluation are applied to implement improvements. | 5

In addition, the radiation control staff will, at all times, be vigilant for ways to reduce radiation exposures by soliciting employee suggestions, evaluating origins of plant exposures, investigating ususual exposures, and assuring that adequate supplies and instrumentation are available.

The plant management will periodically review the radiation exposure data and discuss it with the Manager, Environmental and Radiation Control. This review will seek to identify excessive radiation exposure areas, excessive exposures by job categories, and other exposure trends. They will determine if improvements are needed in plant procedures, health physics procedures, plant equipment or training needs. | 5 | 5

The Health Physics Unit of the Radiological and Chemical Support Section will provide support and review services to plant management in accordance with the plant's needs and the Nuclear Operations Department's and Corporate policy. | 5

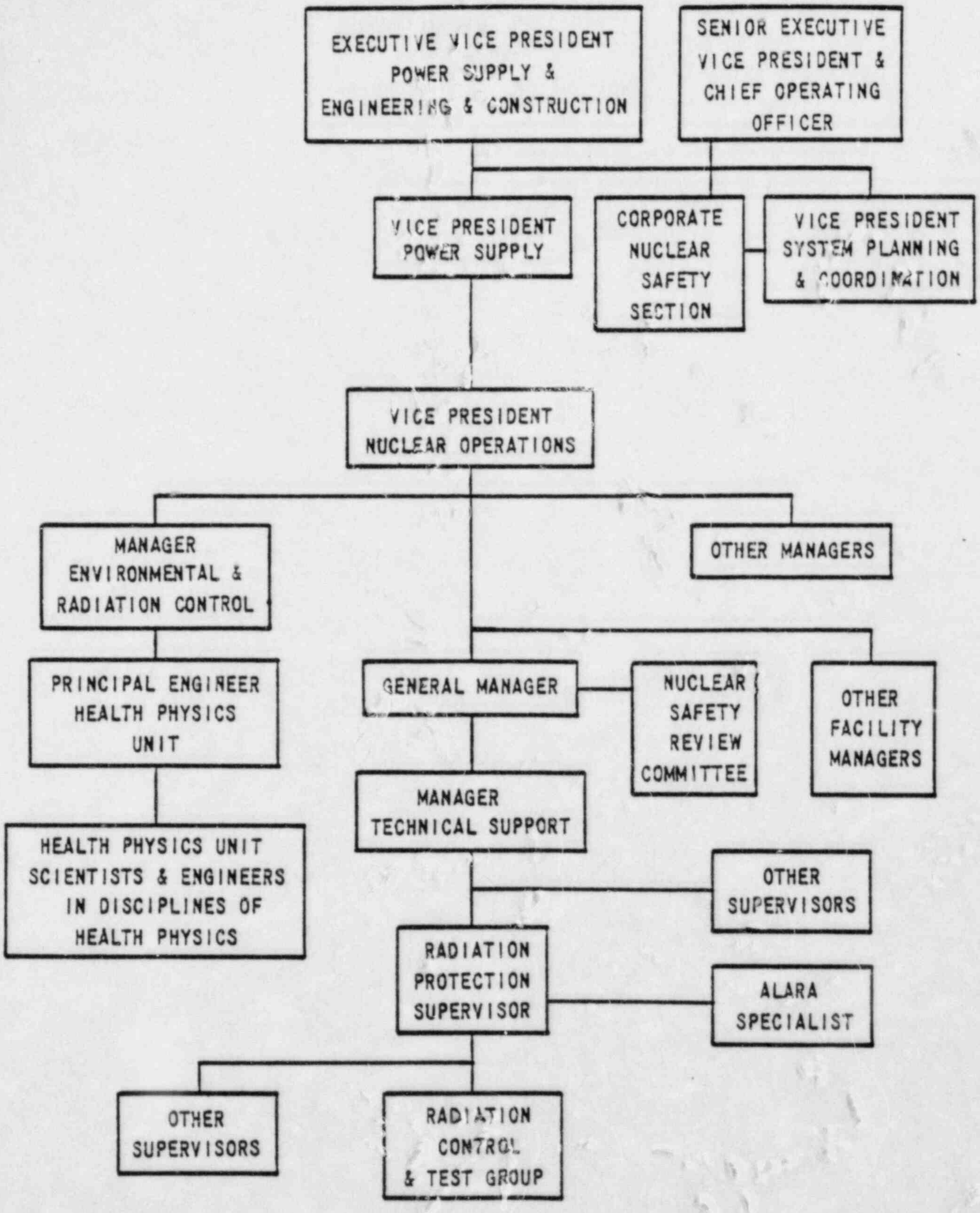
REFERENCES: SECTION 12.1

12.1.2-1 T. D. Murphy, WASH-1311, UC-78, A Compilation of Occupational Radiation Exposure from Light Water Cooled Nuclear Power Plants 1969-1973, USNRC Radiological Assessment Branch, May 1974.

12.1.2-2 T. D. Murphy, et al., NUREG-75/032, Occupational Radiation Exposure at Light Water Cooled Power Reactors 1969-1974, USNRC Radiological Assessment Branch, June 1975.

12.1.2-3 T. D. Murphy, et al., NUREG-0109, Occupational Radiation Exposure at Light Water Cooled Power Reactors 1969-1975, USNRC Radiological Assessment Branch, August 1976.

12.1.2-4 C. A. Pelletier, et al., National Environmental Studies Project, Compilation and Analysis of Data on Occupational Radiation Exposure Experienced at Operating Nuclear Power Plants, Atomic Industrial Forum, September 1974.



SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	RADIATION PROTECTION AND HEALTH PHYSICS ORGANIZATION	FIGURE 12.1.1-1

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	:	
	:	
CAROLINA POWER & LIGHT COMPANY and NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY	:	Docket Nos. 50-400 OL 50-401 OL
	:	
(Shearon Harris Nuclear Power Plant, Units 1 and 2)	:	

CERTIFICATE OF SERVICE

I hereby certify that copies of all the documents listed on the attached Document List were served this sixteenth day of May, 1984, by deposit in the U.S. mail, first class, postage prepaid, to the parties on the attached Service List, except for Charles A. Barth, Esquire and Janice E. Moore, Esquire, Office of Executive Legal Director, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 whose copies were served by hand delivery on May 16, 1984 and Mr. Wells Eddleman, 718-A Iredell Street, Durham, North Carolina 27705 and M. Travis Payne, Esquire, Edlestein and Payne, Post Office Box 12607, Raleigh, North Carolina 27605, whose copies were served by deposit with an air courier to be delivered to a messenger for hand-delivery on May 16, 1984.

Pamela H. Anderson

Pamela H. Anderson

Dated: May 16, 1984

DOCUMENT LIST

1. Applicants' Motion For Partial Summary Disposition of Joint Contention VII.

2. Applicants' Statement of Material Facts As To Which There Is No Genuine Issue To Be Heard on Joint Contention VII.

3. Affidavit of Thomas F. Timmons and Attachments 1 - 5 thereto.

4. Affidavit of Glenn E. Lang and Figure 1 and Attachment 1 thereto.

5. Affidavit of Michael J. Hitchler and Tables 1 - 8 attached thereto.

6. Affidavit of Alan B. Cutter and Exhibits A and B attached thereto.

7. Affidavit of Dr. William H. Wilkie and Exhibits A and B attached thereto.

8. Letter to Administrative Judges Kelley, Bright and Carpenter dated May 16, 1[illegible].

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY and NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY	)	Docket Nos. 50-400 OL 50-401 OL
	)	
(Shearon Harris Nuclear Power Plant, Units 1 and 2)	)	

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