UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

SOUTH CAROLINA ELECTRIC AND GAS COMPANY

Docket No. 50-395 OL

Virgil C. Summer Nuclear Station, Unit 1

> AFFIDAVIT OF EDWARD F. BRANAGAN, JR. ON CONTENTION ALO

I, Edward F. Branagan, Jr., being duly sworn, state as follows:

- I am employed by the U.S. Nuclear Regulatory Commission as an Environmental Scientist in the Division of Systems Integration, Office of Nuclear Reactor Regulation.
- 2. Contention AlO states:

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The following effects - on a long term basis - have been sufficiently underestimated by the Applicant and the Staff so as to compromise the validity of the favorable Benefit-Cost balance struck at the construction permit phase of this proceeding:

a) The somatic and genetic effects of radiation releases, during normal operation, to restricted and unrestricted areas, said releases being within the guidelines and/or requirements of 10 C.F.R. Part 20, and Appendix I to 10 C.F.R. Part 50;

b) The health effects of the uranium fuel cycle, given the release values of the existing Table S-3 of 10 C.F.R. Part 51.

3. I have reviewed the Applicant's May 7, 1981 motion for summary disposition of Contention A10 and supporting affidavits, and concur with the conclusion reached therein; namely, that the health effects from normal operations and the nuclear fuel cycle have been adequately assessed and do not weigh heavily on the benefit-cost balance. I also concur with Dr. Hamilton's basic conclusion that the health effects from the operation of the Summer nuclear plant, and the effects of the supporting uranium fuel cycle are "de minimus particularly when compared to the dose committment and potential health effects resulting from natural background radiation." Affidavit of Leonard D. Hamilton at 2. The Applicant has relied on the dose estimates in the Draft Environmental Statement (DES) to support its conclusion. While the dose estimates in the Final Environmental Statement (FES) are different than those in the DES, the differences are not large and the basic conclusions of the DES respecting health effects have not changed.

4. The differences in doses to offsite individuals and populations between the DES and FES are primarily due to changes in the radiological effluent source terms and in revised meteorological dispersion factors. The largest differences in dose estimates between the DES and FES concern the generic value used to estimate occupational exposure. The generic occupational exposure estimate in our environmental impact statements has increased from about 500 person-rem/yr (as in the DES) to a more conservative 1,300 personrem/yr (as in the FES). The earlier occupational exposure estimate was based on the average annual dose for the nuclear power reactor industry. The new occupational exposure estimate represents the highest average annual dose for individual operating pressurized water reactors.

- 2 -

- 5. I prepared Sections 4.5 and 4.7.5 of the FES containing the Staff evaluation of health effects. Their contents are true and correct to the best of my knowledge and I hereby adopt them as my direct testimony on Contention A10.
- In regard to Contention A10, I do not think the health effects have 6. been underestimated in the FES for several reasons. First, the risk estimators that were used to estimate health effects in the FES are derived from the recommendations of the National Academy of Sciences Biological Effects of Ionizing Radiation Committee report in 1972 entitled "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation" (BEIR-I). This report consists of a comprehensive review and re-evaluation of the scientific basis of radiation exposure on humans by scientists who are eminent in their field. Second, the risk estimators that were used in the FES are consistent with the recommendations of a number of recognized radiation protection organizations, such as the International Commission on Radiological Protection (ICRP), the National Council on Radiation Protection and Measurements (NCRP), the National Academy of Sciences BEIR III Committee, and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). These organizations represent the views of the overwhelming majority of the members of the scientific community.

Third, although no health effects have been observed at doses as low as those estimated in the FES, a linear nonthreshold relation between dose and effect has been <u>assumed</u>. This is conservative

- 3 -

(i.e. an overestimate) for several reasons: (1) the doses
estimated in the FES are much lower than the doses at which cancers
have been observed in human populations exposed to radiation;
(2) the dose rates in the FES are much lower than the dose rates at
which cancers have been observed in human populations exposed to
radiation; and (3) for low Linear Energy Transfer (LET) radiation
such as gamma rays and x-rays it is quite possible that some of
the initial damage to the biological systems can be repaired.
Consequently, the possibility of no effects at these levels cannot
be excluded.

- 7. In summary, I know of no studies of the effects of radiation on human beings that would change the validity of the favorable benefit-cost balance struck at the construction permit stage.
- 8. Recently, the Atomic Safety and Licensing Appeal Board (ASLAB) in <u>Philadelphia Electric Co</u>. (Peach Bottom Atomic Power Station, Units 2 and 3), ALAB-640, _____ NRC ____ (May 13, 1981), adopted radon release values for use in the cost-benefit analyses for the Peach Bottom, Hope Creek and Three Mile Island reactors. We have reviewed the ASLAB's adopted radon release values and conclude the following:
 - The ASLAB's adopted radon release rates (6600 Ci/Annual Fuel Requirement (AFR)) during active mining and milling are not significantly different from those used in the Summer FES (5190 Ci/AFR).
 - Use of the ASLAB's long-term radon release rates after mining and milling have ceased (91 Ci/AFR/yr for ASLAB's case 2) would

- 4 -

not result in significantly different impacts than the values used in the Summer FES (i.e., 38 Ci/AFR/yr for 100 years, 47 Ci/AFR/yr for the next 400 years, and 137 Ci/AFR/yr for periods beyond 500 years).

Consequently, I conclude that use of these new radon release values to estimate health effects in the Summer FES would not change the validity of the favorable benefit-cost balance.

Edward F. Branagan, Jr.

Subscribed and sworn to before me this 22 + day of May, 1981.

Motary Public Public Notary Public My Commission expires: July 1, 1982

EDWARD F. BRANAGAN

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 3 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 Laborator, involving development of a computer program to calculate health effects from diation, (3) served as a technical monitor on an NRC contract with Idaho Nacional 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.

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CERTIFICATE OF SERVICE

I hereby certify that copies of NRC STAFF RESPONSE TO APPLICANT'S MOTION FOR SUMMARY DISPOSITION OF INTERVENOR BURSEY CONTENTION 10 in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 27th day of May, 1961.

Herbert Grossman, Esq., Chairman Atomic Safety and Licensing Board Panel U.S. Nuclear Regulatory Commission Washington, D.C. 20555 *

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Steven C. Goldberg Counsel for NRC Staff