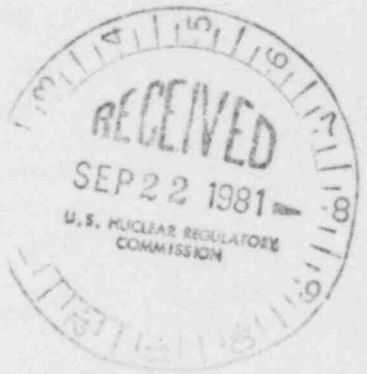
STAFF 9/18/81

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
SOUTH CAROLINA ELECTRIC & GAS COMPANY	)	Docket No. 50-395
	)	
(Virgil C. Summer Nuclear Station, Units 1)	)	

NRC STAFF PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW IN THE FORM OF A PARTIAL INITIAL DECISION



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The NRC Staff, in accordance with 10 C.F.R. § 2.754, proposes the following findings of fact and conclusions of law in the form of a partial initial decision.

I. INTRODUCTION AND BACKGROUND

1. The notice of opportunity for hearing in this matter was published on April 18, 1977 (42 Fed. Reg. 20203). The Notice was published in connection with an operating license application filed by the South Carolina Electric and Gas Company (SCE&G), for itself and as agent for the South Carolina Public Service Authority (SCPSA) (hereinafter referred to jointly as "Applicant"), for the Virgil C. Summer Nuclear Station. The facility is located approximately 26 miles northwest of Columbia, South Carolina. The Notice provided an opportunity for any person whose interest might be affected by the proceeding to file a petition for leave to intervene no later than May 18, 1977 pursuant to 10 C.F.R. § 2.714.

2. On May 27, 1977, a [illegible]mely petition was filed by Brett A. Bursey (Intervenor). After several rounds of responsive pleadings, the petition was granted by Board Order, dated February 3, 1978.

3. The first prehearing conference was held on March 30, 1978. On April 24, 1978, the Board issued a Prehearing Conference Order designating eight contentions admitted as matters in controversy in the proceeding.

4. On August 2-3, 1978, a second prehearing conference was held in this matter and oral depositions taken before the Board from several former construction workers concerning alleged inadequacies in construction practices at the site. The Intervenor had secured the attendance of these deponents in order to provide information in support of his contention regarding poor quality control at the Summer site (Contention 9).

5. On October 3, 1978, the NRC Staff filed a motion for summary disposition of two contentions (Contentions 6 and 7) regarding water quality matters. This motion was granted by Memorandum and Order, dated April 9, 1979.

6. In June, 1979, the Staff issued its Draft Environmental Statement (DES) which was circulated for public comment. A supplement to the DES was issued in November, 1980 to consider the site-specific effects of serious reactor accidents pursuant to the then recent Commission statement of interim policy regarding accident considerations pursuant to the National Environmental Policy Act.[1/] The Final Environmental Statement (NUREG-0534) issued in May, 1981.

1/ 45 Fed. Reg. 40101 (June 13, 1980).

7. In February, 1981, the Staff issued its Safety Evaluation Report (SER) (NUREG-0717) relative to the Summer license application. Supplements to the SER were issued in April and May, 1981.

8. On March 23, 1981, almost four years after the filing date set forth in the notice of opportunity for hearing in this matter and within months of the scheduled evidentiary hearing, Fairfield United Action (FUA) filed an untimely petition for leave to intervene in this proceeding.

9. On April 7, 1981, a final prehearing conference was held to discuss final plans for the conduct of the evidentiary hearings in this matter and the FUA petition.

10. Over the objections of the Applicant and Staff, the Board granted the FUA petition by Order of April 30, 1981. The Applicant and Staff appealed this ruling and, on June 1, 1981, the Appeal Board issued its Order reversing the grant of late intervention (ALAB-642). Petitioner FUA filed a request for Commission review of ALAB-642 on June 15, 1981. The Commission did not grant review of ALAB-642.

11. By Order, dated June 19, 1981, the Board granted separate Applicant and Staff motions for summary disposition of Contention 3 concerning the ability of the Applicant to meet NRC Staff requirements regarding anticipated transients without scram. The Board denied the Applicant motion for summary disposition of Contention 10 (health effects) and Staff motion for summary disposition of Contention 2 (financial qualifications/decommissioning costs) and Contention 4(b) (seismic monitoring).

12. On June 22, 1981, evidentiary hearings commenced to adduce testimony on the contentions remaining in issue, namely, Contention 2 (financial qualifications) 4 (seismicity), 8 (emergency planning), 9 (quality control) and 10 (health effects).[2/]

13. Three evidentiary sessions were held on June 22-26, June 29-July 3, and July 13-17. The record was closed on contentions 2, 9 and 10. Findings on these contentions are given below.

14. The record remains open on Contention 4 concerning seismicity and Contention 8 concerning emergency planning. The Board has indicated its intention to conduct further hearings on Contention 8 beginning September 22. 1981.

II. MATTERS IN CONTROVERSY

A. Financial Qualifications

Contention 2

(a) The Applicant lacks the financial qualifcations necessary to safely operate and decommission the Summer station in compliance with NRC rules and regulations;

(b) The sum allocated by the Appliant for decommissioning of the Summer Plant (less than $10 million) is grossly inadequate and does not conform to the requirements of 10 C.F.R. § 50.33(f).

2/ The Board also elicited testimony from the Applicant on questions regarding hydrology (Tr. 1263-1379), management commitment (Tr. 2841-2976) and occupational exposures procedures (Tr. 3937-62). The Board is satisfied with the Applicant's answers to these questions.

1. Introduction

15. Section 50.33(f) of the Commission's regulations provides that an application for an operating license must contain information sufficient to demonstrate that the applicant "possesses or has reasonable assurance of obtaining the funds necessary to cover estimated operating costs for the period of the license or for 5 years, whichever is greater, plus the estimated costs of permanently shutting the facility down and maintaining it in a safe condition." 10 C.F.R. § 50.33(f). Appendix C to 10 C.F.R. Part 50 describes the kinds of financial data and other information that demonstrate an applicant is financially qualified. The Commission has held that a "reasonable assurance of obtaining funds" means the applicant must have a reasonable financing plan in light of relevant circumstances. Public Service Co. of New Hampshire (Seabrook Station Units 1 and 2), CLI-78-1, 7 NRC 1 (1978).

16. The Commission does not require an applicant to identify its method of decommissioning at the operating license stage. The only requirement is that there is reasonable assurance that the applicant can pay the costs of decommissioning. 10 C.F.R. §50.33(f). An applicant's decommissioning estimates may be based on a particular method of decommissioning, using cost estimates from recent studies or detailed costs of actual decommissionings. See Duke Power Co. (William B. McGuire Nuclear Station, Units 1 and 2), LBP-79-13, 9 NRC 522, 527 (1979); Kansas Gas and Electirc Co. (Wolf Creek Generating Station, Unit No. 1), LBP-77-3, 5 NRC 301, 340 (1977). When ratemaking statutes allow recovery of decommissioning costs, and the estimated cost is not prohibitive,

Licensing Boards have concluded that an applicant is financially able to decommission a facility. McGuire, 9 NRC at 527; Virginia Electric Power Co. (North Anna Nuclear Power Station, Units 1 and 2), LBP-77-78, 6 NRC 1127, 1162-63 (1979).

2. Testimony

17. The Intervenor did not adduce direct testimony on this contention. Intervenor Bursey had adopted as his prefiled testimony the affidavit of Dr. John Ruoff filed on behalf of then Intervenor FUA in response to the NRC Staff's May 7, 1981 motion for summary disposition of Contention 2. However, at the hearing, the Intervenor stated he would not rely on any previous prefiled testimony, but instead would sponsor a revised statement presented by Dr. Ruoff at the hearing. Tr. 2747. The Board granted the Applicant and NRC Staff motions to strike this testimony and ruled it would treat Dr. Ruoff's presentation as a limited appearance statement. Tr. 2755. The Board rejected as an exhibit a decommissioning study by the Accountants for the Public Interest, but accepted it as a limited appearance statement. Tr. 2793. The Board also accepted Intervenor Exhibit 6, the prefiled direct testimony of Oscar S. Wooten filed in June 1981 in a rate proceeding before the South Carolina Public Service Commission (SCPSC) and ruled it was an admission against the company. Tr. 2581, 2584.

18. The Applicant presented the testimony of Oscar S. Wooten, Vice President - Finance for SCE&G (following Tr. 2536), Kenneth R. Ford,

Vice President, Finance and Treasurer for SCPSA (following Tr. 2553)[3/] and Douglas Warner, Manager, Nuclear Fuel Management Nuclear Fuel Services Department, SCE&G (following Tr. 2542). In addition, the Applicant put into the record financial information submitted to the Staff in accordance with 10 CFR § 50.33(f) and Appendix C to 10 C.F.R. Part 50. Applicant's Exhibits 16, 17, 18, and 35. The Applicant also put into evidence tables which the Intervenor had inadvertently excluded from Intervenor Exhibit 6. Applicant's Exhibit 19.

19. The Staff's direct case consisted of §20 of Supplement No. 1 to the Safety Evaluation Report (SSER), NUREG-0717, designated Staff Exhibit 1A, sponsored through the testimony of Jim C. Petersen, Senior Financial Analyst, Office of State Programs, U.S. Nuclear Regulatory Commission.

a. Costs of Operation

20. The Applicant's financing plan is to recover all costs of operation through revenues derived from their system-wide sales of electricity. Staff's Exhibit 1A, § 20; Applicant's Exhibit 17; Prefiled testimony of Wooten and Ford. Under the Joint Operation Agreement (Applicant's Exhibit 20) the two owners will share the costs of operation. SCE&G will be responsible for two-thirds and SCPSA one-third. (Wooten, Tr. 2533). The estimated cost for operation of the plant, assuming

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3/ By agreement, the prefiled testimony of Mr. Ford was received as if he had appeared and testified. (Tr. 2552).

1983 would be the first full year of operation, would be as follows:

Estimate of Total Annual Cost of Operation of Virgil C. Summer Nuclear Station, Unit 1 4/

Year	1983	1984	1985	1986	1987
Applicants' Estimate					
Plant Capacity Factor (percent)	70.0	70.0	84.0	70.0	70.0
Annual Cost of Operation (millions)	$264.8	$263.6	$273.5	$267.7	$271.6

In the opinion of SCE&G, the operating costs of the plant would not be unduly burdensome since the combined assets of the companies are greater than $3 billion and their current revenues total over $700 million. While the bond rating of SCE&G was downgraded in June of 1981 from "A" to "A-" (Wooten, Tr. 32531), the Staff witness testified that the change to this third highest rating was slight and remained a favorable rating. Petersen, Tr. 2741. Petersen also noted that very few utilities have AA ratings. Id.

21. In reaching the conclusion that the Applicant has a reasonable financing plan in light of relevant circumstances the Staff considered: (1) SCE&G's and SCPSA's bond ratings; (2) the nature of their business as public utilities; (3) their ability to generate net income during the past 5 years; (4) the allowance of capital

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4/ The cost estimates were summarized by the Staff. Staff Exhibit 1A, Table 20-1.

costs in their rate bases under South Carolina law; (5) the overall financial strength of the Applicant; and (6) the reasonable prospect that the facility's costs could be recovered through revenues. Staff's Exhibit 1A (SSER), §20.

22. The Intervenor did not directly challenge the Staff's conclusions regarding the financial strength of SCE&G and SCPSA, but used Intervenor Exhibit 6, the testimony of Wooten before the SCPSC, to discredit that witness' testimony before the Board. The NRC Staff witness characterized the statements made by Wooten before the rate commission about SCE&G's financial health as the utility's effort to present the "worst case possible" that would occur without the rate relief they desired. Petersen, Tr. 2767. Mr. Petersen also maintained that the statements contained in Intervenor Exhibit 6 do not alter the Staff's conclusion that the Applicant is financially qualified. Tr. 2771-72.

b. Costs of Decommissioning

23. The majority of the testimony on Contention 2 focused on the ability of the utilities to pay decommissioning costs. The Applicant did not and under NRC regulations is not required to make a final selection of a method of decommissioning to receive an operating license. See 10 CFR § 50.82. The Applicant has estimated a range of $1 million plus an annual maintenance charge of $100,000 for low-level decommissioning (safe storage) to $70 million for complete dismantlement at the end of the plant's 40 year life. Staff's Exhibit 1A, § 20.4. These estimates, in 1978 dollars, were based on a Battelle study, "Technology, Safety and Costs of Decommissing a Reference Pressurized Water Power Reactor Station," NUREG/CR-0136, (June 1978), and Regulatory Guide 1.86, "Termination of Operating Licenses for

Nuclear Reactors." Warner, Tr. 2537-38. The Staff relied on the $70 million figure because it was conservative and substantially in excess of the amounts detailed in the study. Petersen, Tr. 2772; Staff's Exhibit 1A, § 20.4.

24. The limited appearance statement of Dr. Ruoff raised the issue of whether $70 million dollar figure should be adjusted for inflation at 7 to 14% for 30 years. If so adjusted, decommissioning costs would range between $733.7 million to $4.9 billion. Ruoff, Tr. 2746. The Staff witness would not adopt these figures and remarked that any prediction about inflation rates was spectulative and not meaningful. Tr. 2738. Mr. Petersen did testify that the actual amount necessary at the end of the useful life of the plant could possibly exceed $70 million by a substantial amount; however, he noted that the Applicant had committed to continually review technological advances in decommissioning methods and to make corresponding adjustments in its provision for decommissioning funds. Tr. 2774-75; See Staff's Exhibit 1A, § 20.7. The Staff also maintained that the ability of the utilities to finance the facility at a cost of nearly a billion dollars also supports the conclusion that there is reasonable assurance that they will be able to decommission the plant at the end of its useful life. Staff's Exhibit 1A, § 20.7. However, the cost of decommissioning will ultimately be determined by the method chosen and may not exceed the $70 million estimated for comolete dismantlement. See Petersen, Tr. 2737.

25. Of particular interest to the Board and the Intervenor was the Applicant's plan to use the negative net salvage approach, which would result in an unfunded reserve, to provide for decommissioning costs. Mr. Petersen testified that the Commission is studying the status of decommissioning

requirements, including the funding of decommissioning.[5/] At present, no particular method of funding is required. Tr. 2704. While Mr. Petersen personally would prefer a funded reserve for decommissioning since it would provide a greater assurance that funds would be available, in his opinion, the NRC Staff could not require any greater assurance than the "reasonable assurance" required by the regulations. Tr. 2716-17, 2733-34. Furthermore, Mr. Petersen's preference for a funded reserve was a general observation and not prompted by any peculiar circumstances attributed to the Summer application. Tr. 2740. Mr. Petersen maintained that the negative net salvage approach was a reasonable method of providing for the costs of decommissioning.[6/]

26. The possibility that a premature termination of the facility's operation, such as a TMI accident, may require premature decommissioning and adversely affect the ability of the utilities to raise funds for decommissioning was also of concern to the Intervenor. Bursey, Tr. 2561. The Applicant testified that if premature decommissioning was necessary, it would respond by first determining the type of decommissioning necessary and the cost of such decommissioning. Second, SCE&G would

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5/ On August 18, 1981 (46 Fed. Reg. 41786) the Commission published a proposed rule on decommissioning that contained two alternatives: (1) complete elimination of the NRC's financial qualifications review, including decommissioning or (2) abolish the financial qualifications review for operating license applicants and retain only the present decommissioning review.

6/ Petersen did admit that the approach does not exclusively place the cost of decommissioning on the current rate payers, contrary to the position of the Applicants. Tr. 2732-33.

approach the appropriate regulatory authorities to obtain rate relief. Tr. 2562. Mr. Petersen explained that the NRC Staff does not, as part of its review, consider the likelihood of an event that may necessitate decommissioning of the facility before the end of its license. Rather, the term "permanent shutdown" in the regulations has always been interpreted as occuring at the end of the normal life of the plant. Tr. 2723-24. Should premature shutdown occur, however, the Applicant could resort to other funds apart from negative net salvage such as internally generated funds and external sources. Tr. 2724-25.

27. The Board finds, upon evidentiary examination of the estimated costs of operation, the estimated costs of decommissioning, and the proposed financing plans for operation and decommissioning that the Applicant has demonstrated reasonable assurance of obtaining funds to operate and decommission the Summer facility thrcugh reasonable financing plans. The Board further finds, contrary to Contention 2(b), that the Applicant has allocated an adequate amount for decommissioning.

B. Quality Control

Contention 9. The quality control of the Summer plant is substantially below NRC standards as evidenced by consistently substantial workmanship in several aspects during the construction of the plant.

28. The Intervenor's direct case on this contention consisted of the August 2, 1978 deposition of former construction contractor employees,

Stanley O. Fort (Intervenor's Exhibit 3) and Curtis G. Whisennant (Intervenor's Exhibit 2) and an NRC Office of Inspection and Enforcement (I&E) inspection report (No. 79-35), dated February 13, 1980, concerning allegations made by another former workman, Clarence Crider (Intervenor's Exhibit 1) (Tr. 1437).

29. The principal allegation made by Mr. Fort was that heavy wall carbon steel piping was being welded without proper preheating (Intervenor's Exhibit 3 at Tr. 4-12). The principal allegation raised by Mr. Whisennant was that a problem existed with repeated repairs to a weld on a service water pipe. (Intervenor's Exhibit 2 at Tr. 10, 34, 83). The principal concern to emerge at the hearing regarding Mr. Crider's concerns was the allegation that numerous undersized socket welds were accepted in safety-related piping. (Intervenor's Exhibit 1).

30. The Applicant's direct case on this contention consisted of the prefiled testimony of Mr. Daniel A. Nauman, Group Manager, and Mr. E.H. Crews, Vice-President and Group Executive Nuclear Services (following Tr. 1387). This testimony was supplemented by the additional appearance of Mr. James M. Woods, III, manager of Quality Control. Mr. Nauman provided testimony concerning the overall quality assurance/quality control program (QA/QC) in place at the plant and the internal procedures for identifying and correcting deficient construction work. Nauman testimony at 1-14, See also Tr. 1390-1400.

31. Mr. Nauman described the program in the following terms: The quality assurance organization is an "overview" group, that is, developer and "keeper" of the program. It is this organization's responsibility to

identify problems and monitor success of corrective action. In such a system, the responsibility to correct the areas of concern rests with the managers of the area in which the problem resides. In the organizational structure there is a separation between construction quality control and quality assurance. The quality control function may be considered "hands on" inspections and testing. As such, it is the job of quality control personnel to check the attainment of painstakingly developed engineering acceptance criteria from which they cannot be permitted to deviate. The quality assurance organization monitors and observes this activity, but in addition, considers whether the results the engineer intended are being achieved. If there is doubt, that information is relayed to the technically qualified people (engineering) for consideration. Id. at 3.

32. Mr. Crews provided testimony concerning the Applicant's management commitment to assuring quality construction of the Summer plant through an effective QA/QC program. Crews Testimony. The Applicant also introduced several documentary exhibits, including a welding instruction booklet and general handbook for the Applicant's construction contractor. Applicant Exhibits 6-10.

33. Mr. Nauman addressed the allegations made by Mr. Fort. Nauman testimony at 15-22. Mr. Nauman testified that Mr. Fort was employed by the construction contractor, Daniel Construction Company, as a welder from April 17 to June 7, 1978 and that he never performed any safety related welding at the plant. Id. at 15. Mr. Nauman explained the applicable preheating weld requirements. He testified that field welds were reviewed for the six nonsafety welds performed by Mr. Fort which

verified that they had been adequately preheated prior to any welding on the joints. Id. at 17-18. Post-weld heat treatment records were also examined for other welds. This examination showed proper rejection for a number of weld defects, but none that could be directly associated to preheat or post weld treatment problems. Radiography reports reflect proper detection of welding flaws. It was finally noted that the final "as built" acceptability of all these welds is attested to by satisfactory radiographs of the joint and hydrostatic test. Id. at 19-20.

34. Mr. Nauman addressed the allegations raised by Mr. Whisennant. Nauman testimony at 22-26. Mr. Nauman testified that Mr. Whisennant was employed at the plant as a welding supervisor from June 7 to October 30, 1976. Id. at 22. Mr. Whisennant's position was characterized as administrative in nature. He was apparently unqualified to perform welding and performed no welding during his five months of employment. Id. at 26. The water pipe which Mr. Whisennant claims necessitated repeated repairs was safety related. Nauman testimony at 22. The Applicant's quality assurance records indicated that the weld in question was approved by inspection following certain repairs required by visual and radiographic rejections. Id. Mr. Nauman testified that the quality assurance records demonstrated that all welds on service water piping, including the subject weld, were inspected and approved in accordance with all quality assurance requirements. Id.

35. Mr. Nauman also extensively addressed all of the allegations raised by Mr. Crider and documented in IE Report No. 79-35. Nauman

testimony at 26-63. Mr. Nauman testified that, before Mr. Crider reported his allegations to the NRC about inadequate welding, the Applicant tried unsuccessfully to have Mr. Crider specify the precise locations of any substandard work thus impeding the ability of the Applicant to pursue the matter. Id. at 27-33. Instead, the Applicant maintained close surveillance on the activities associated with the allegations investigated in IE Report 79-35. Id. Mr. Nauman explained the Applicant's actions with regard to each such allegation in his prefiled testimony.

36. The allegation regarding undersized socket welds was confirmed by IE inspection and two infractions issued as a result in IE Report 79-35. Id. at 37-38. The Applicant conservatively reinspected all of the nearly 14,000 socket welds made at the plant and repaired those requiring it. Id. at 39-40.

37. The Staff direct case on this contention consisted of the prefiled testimony of the Office of Inspection and Enforcement (IE), following Tr. 2814. This testimony was sponsored by an eight-member panel (expanded during the course of the hearing) consisting of the following: Messrs. Virgil L. Brownlee, Edward H. Girard, John Skolds (the resident inspector), Charles E. Murphy, William P. Ang, Joseph Lenahan, and Bruce Cochran. The testimony explained the NRC programmatic construction inspection program and the nature of enforcement actions utilized by the NRC to ensure compliance with regulatory requirements. IE Testimony at 4-5, Attachment A.

38. The testimony discussed the implementation of the QA/QC program

at the Summer plant during construction primarily in terms of the inspection history compiled by the Office during plant construction. A summary of which the items of noncompliance identified over the course of construction and their significance were described in the testimony. IE Testimony of 4-8.

39. The testimony also provided a complete discussion of the IE investigation into the allegations raised at the August 2, 1978 deposition by Messrs. Fort and Whisennant and three other prior workers whose depositions were not offered into evidence by the Intervenor. Id. at 9-12, Attachment C; See also Cochran, Tr. 3505-6 and Murphy, Tr. 3506-12. The IE investigation revealed no items of noncompliance. Id. at 12.

40. With regard to Mr. Fort's allegation about improper preheating of certain safety-related piping, IE observed a number of "in-process" welds during various stages of fabrication to determine whether applicable requirements and procedures were being met. Id. at 1-4. Weld identification, joint preparation and alignment, evidence of QC verification of fitup, use of specified weld procedures, weld appearance, welder qualification, use of specified preheat and interpass temperatures, use of specified weld material, and practice of grinding starts and stops, as applicable to each weld, were examined. Id. at 1-5. During observation of the welding activities, the IE inspector paid special attention to preheat and interpass temperature controls and practices. Most of the welds observed were heavy wall carbon steel which required a minimum preheat of 200 degrees F. The preheat was not to be interrupted until the weld was 30% complete. In all cases observed,

these requirements were being met. Id.

41. With regard to Mr. Whisennant's allegation about consistent repairs to a particular weld, an IE inspector reviewed weld records for the weld in question. Id. at 1-2. The records indicated two repair attempts and that the joint was then cut. After cutting, one repair was required. Id. The inspector reviewed the "controlled weld joint records" for all welding, including repairs. The welding procedure and welder qualification records were also reviewed. Id. This disclosed that, although several repairs were required, the records appeared to be in order and there was nothing to indicate that the acceptability of the finished weld should be questioned. Id. at 1-3.

42. The IE testimony also described at considerable length the concerns brought to its attention by Mr. Crider, the investigations conducted into these matters and the investigation findings. IE Testimony at 12-21. Two items of noncompliance directly related to the allegations were identified Id. at 21. The Office of IE is satisfied that the Applicant has taken corrective action relative to the confirmed allegations with safety significance. Id.

43. In material fact, the investigation confirmed that some undersized socket welds were made. Id. at 19; Girard, Tr. 3522-24. As earlier noted, the Applicant reinspected the socket welds and repaired those requiring it. Nauman testimony at 39. The Office of IE audited the repaired welds and was satisfied that the problem had been corrected IE Testimony at 19, 21; Girard, Tr. 3522-24. Moreover, witnesses from the Office of IE testified that similar welding problems had been

experienced at other sites. Girard, Murphy, Tr. 3525. These witnesses further testified that, based on an examination of the history of failed socket welds, none were attributable to undersized welds and that weld size has a large fraction of safety associated with it. Girard, Murphy, Tr. 3525-6.

44. In summary, IE testified that, based upon the results of its construction inspection program at Summer, there is reasonable assurance that the equipment and materials were procured pursuant to design specifications. IE Testimony at 22. It was further concluded that the Applicant had a demonstrated commitment to QA/QC at the plant and that the plant has been constructed in accordance with commitments in the Final Safety Analysis Report and can be safely operated. Id.; Murphy, Tr. 3572. It was further testified that on the basis of an in-depth utility evaluation program being performed by the NRC on a national basis, known as the Systematic Analysis of Licensee Performance review, the Applicant's performance at Summer was adjudged above average in terms of plants under construction within NRC Region II Murphy. Tr. 3567-68.

45. In light of the above evidence, the Board finds that the Applicant's construction quality control program and procedure has been adequate to assure that the plant has been built in a safe manner in conformance with design specifications.

C. Health Effects

Contention 10

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.

1. Introduction

46. Health effects of routine emissions from operation of a nuclear plant may be adjudicated in individual licensing proceedings. Public Service Co. of Oklahoma (Black Fox Station, Units 1 and 2), CLI-80-31, 12 NRC 264 (1980). A Licensing Board may take official notice of, or reach its decision based in part on, the National Academy of Sciences' Biological Effects of Ionizing Radiation Committee Report of 1972 (BEIR-I) because it contains a "generally accepted evaluation of the effects of ionizing radiation." Id. at 277.

47. Table S-3 to 10 CFR Part 51, which contains release values for uranium fuel cycle effluents, does not contain values for Radon-222. This Board may use the estimated releases in the "lead opinion" on radon, Philadelphia Electric Co. (Peach Bottom Atomic Power Station, Units 2 and 3), ALAB-640, 13 NRC___ (May 13, 1981), to serve as a basis for consideration of the health effects from that effluent. See Peach Bottom ALAB-480, 7 NRC 796, 805-806 (1978).

48. In our June 19, 1981 Memorandum and Order we denied the Applicant's motion for summary disposition of contention 10 in order to hear testimony on the propriety of the conclusions reached in BEIR committee reports which the Applicant and Staff relied on in estimating health effects. Memorandum and Order at 4. Dr. Morgan, in his prefiled testimony, had criticized the BEIR reports because they relied almost

exclusively on the results of the atomic bomb studies, which used selective populations and underestimated gamma radiation. Id.

2. Evidence

49. The Intervenor's direct case on this contention was the testimony of Dr. Karl Z. Morgan (prefiled testimony following Tr. 1545).[7/] Dr. Leonard D. Hamilton (prefiled testimony following Tr. 2380), testified on behalf of the Applicant. The Staff's direct case consisted of pertinent portions of the Virgil C. Summer Final Environmental Statement (FES), NUREG-0719, dated May 1981, (Staff's Exhibit 3), which was received into evidence by stipulation of the parties (Tr. 2385), and the testimony of Dr. Edward F. Branagan who had prepared Sections 4.5 and 4.7.5 of the FES. Dr. Branagan also submitted written rebuttal testimony (following Tr. 2406)[8/] and testified at the July 17 hearing session (Tr. 3822-37) to clarify earlier testimony.[9/]

7/ The Intervenor had originally intended to present the prefiled testimony of two other witnesses, Drs. Helen Caldicott and Michio Kaku. The Board excluded Dr. Kaku's testimony as repetitious of Dr. Morgan's testimony. Tr. 1690-91. Dr. Caldicott never appeared to testify.

8/ At the April 7-8, 1981 prehearing conference, the Board gave the Applicant and Staff permission to file rebuttal testimony since it was uncertain whether the Intervenors witnesses would appear to testify at the hearing. Tr. 455-58; Remainder of Order Following Fourth Prehearing Conference at 9.

9/ The Board suggested a procedure for Dr. Morgan to respond to Dr. Branagan's clarification, if necessary, (Tr. 3822-3830) but Dr. Morgan offered no reply.

a. Risks due to radiation exposure from normal operations

50. The Staff's position is that where individual doses associated with exposures are controlled according to the limits of 10 C.F.R. Part 20 for the exposure of workers and the general public, and the dose design objectives of 10 C.F.R. Part 50, Appendix I are being met for the general public, the risk to individuals will be extremely small. Staff's Exhibit 3, §4.5.5. The risks to the general population will be similarly small because no health effects, somatic or carinogenic, have been detected at the doses estimated in the FES. See Id. at 4-28.

51. The health effects from the low level ionizing radiation that would result from normal operation were estimated in the FES by multiplying the dose commitment (in units of person-rem) by an appropriate risk estimator. Branagan Rebuttal Testimony at 1-3. The risk estimators used in the FES are based on the linear dose response and the "absolute risk" models described in the BEIR I Report. Id. at 2-3; Branagan, Tr. 2394. The Staff used two risk estimators in the FES: (1) 140 potential cancer fatalities per million person-rem ($140/10^6$ person-rem) and (2) 260 potential cases of all forms of genetic disorders per million person-rem ($260/10^6$ person-rem). Tr. 2459; Staff's Exhibit 3, § 4.5.5. Dr. Branagan testified that these risk estimators are comparable to the values recommended by the 1980 BEIR Committee Report (BEIR III), BEIR I, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the National Council on Radiation Protection and Measurements (NCRP), and the International Commission on Radiological Protection (ICRP). Tr. 2395. These organizations represent the views of the overwhelming majority of the scientific community. Id.

52. To sufficiently characterize the risk, the FES contains a range of values for risk estimators. Branagan Rebuttal Testimony, at 6, 9; Tr. 2396. If the cancer death risk estimator were based on the "relative risk" model and the assumption that risk prevails for the duration of life, the value could be about four times higher (approximately 500 potential cancer mortalities per million person rem). Staff's Exhibit 3 at 4-25; Tr. 2394. The range for the cancer risk estimator could also include zero. Id. The genetic risk estimator, if adjusted for uncertainty, could range from about 60 to 1500 potential genetic defects per million person-rem. Staff Exhibit 3, §4.5.5. Dr. Hamilton testified that the FES sufficiently estimated health effects by using the linear extrapolation. Tr. 2379.

53. Dr. Morgan used 900 potential cancer fatalities per million person-rem as the risk estimator for health effects. Tr. 1645. He admitted that the value was substantially higher than the values used by the major radiation protection organizations. Tr. 1647-1649. Dr. Hamilton concurred with the risk estimators in the FES. Tr. 2332, 2334. He based his risk estimates on the UNSCEAR, BEIR I and BEIR III Reports. Tr. 2326.

54. Drs. Hamilton and Branagan found that 1300 person-rem is a conservative estimate of dose for the calculation of health effects because it is the highest exposure observed at any plant and is not the average exposure. Tr. 2467; 2468. Dr. Branagan pointed out that the 1300 value was only applicable to nuclear plant workers. Tr. 2471. Dr. Morgan used the same dose to compute the health effects from operation since it was comparable to his estimate of 1500 person-rem for annual population dose. Tr. 2489-2493. To calculate the potential cancer deaths over the life

of the plant Dr. Morgan multiplied 1300 (1.3×10^3) times 900 potential cancers per million person rem (9×10^{-4}) times 30. The result was 35 potential lethal cancers and 70 potential nonlethal cancers over the life of the plant, Tr. 2494.

55. Dr. Hamilton estimated that 16 potential cancer deaths could result from 30 years operation of the plant and the uranium feul cycle.Tr. 2410. Dr. Branagan estimated that there would be 15 potential cancer deaths for 30 year operation of the plant. Tr. 2463. Staff did not calculate the potential nonlethal cancers, but the FES noted that the BEIR III report estimates the number of nonfatal cancers would be approximately 1.5 to 2 times the number of potential fatal cancers. Staff's Exhibit 3 at 4-25.

56. Dr. Morgan's risk estimator for potential cancer deaths is beyond the range of the values considered in the FES (140 to $500/10^6$ person-rem). Staff's Exhibit 3, §4.5.5. Dr. Morgan's genetic risk estimator of 44,000 potential genetic defects per million person rem (Tr. 2495-96) is considerably above the estimates used by the majority of the scientific community. Branagan, Tr. 2824. Dr. Morgan multiplied 1.8×10^{-3} times 4.4×10^{-2} times 30 to obtain an estimate of 1716 or approximately 1700 potential genetic defects. Tr. 1495-96. Dr. Morgan maintained that his estimator was derived from Table 4 on page 57 of the BEIR I report. Tr. 2499. The NRC Staff witness, however, testified that 44,000 value was way above the highest value of 1500 he could derive from Table 4. Tr. 3727-28.[10/]

10/ Dr. Morgan had performed his calculations late the night before and apparently did not have a change to check them. Tr. 2503. This could possibly explain the great discrepancy between Dr. Morgan's risk estimator and those used by the Applicant and Staff. Dr. Morgan also admitted that his knowledge of genetic risks was very limited and he would have to rely on the various publications (BEIR, UNSCEAR, ICRP and NCRP) to obtain risk coefficients. Tr. 2495.

in all future generations of the exposed workforce population due to one year of operation. Staff's Exhibit 3, §4.5.5. For 30 years of operation the result would be 9 potential genetic disorders. Branagan, Tr. 3827-28. The highest value in for a genetic risk estimator from BEIR I would yield approximately 60 potential genetic defects. Branagan, Tr. 3828.

58. The risk of potential premature cancer death to the average individual living within 50 miles of the plant from exposure to radiation release is less than one percent of the risk to the maximum individual estimated by the Staff. Staff Exhibit 3, at p. 4-28. This risk is insignificant in comparison to the risk of premature death from cancer from exposure to other sources of radiation in the U.S. Id.; Hamilton Affidavit at 2.

b. Risks from uranium fuel cycle

59. The Staff considered the health effects from the uranium fuel cycle based upon the release values in Table S-3 and an analysis of radon releases. Staff's Exhibit 3, §4.7. The Staff considered the short-term effects of mining, milling, and active tailings and the potential long-term effects from unreclaimed open-pit mines and stablilized tailings. Id. §4.7.5, at 4-42. The estimated health effects of a 1000-MW light water reactor operating at 80% capability for 30 years would be 3.3 to 5.7 cancer fatalities in 100 years, 5.7 to 17 in 500 years and 36 to 60 in 1000 years as a result of radon rele.. Id. at 4-43. In comparison to estimated cancer fatalities that could result from radon-222 and other nuclides occuring naturally in the environment, the estimated health effects are a tiny fraction of those from natural background radiation. Id. Thus, the Staff concluded in the FES that health

effects from the uranium fuel cycle are insignificant in comparison to the health effects to the U.S. population from all background sources of radiation. Id.

60. Dr. Branagan testified that the favorable cost-benefit balance reached in the FES would not change if the radon release values adopted by the Appeal Board in the Peach Bottom proceeding were used. Tr. 3829-30. He noted that the radon release rate of 6600 curies per annual fuel requirement was comparable to the 5190 release rate used in the FES. Id. The long term release rate of 91 curies per annual fuel requirement per year (Ci/AFR/yr) where the tailings are covered and the mines are left unsealed would not cause health effects significantly different from those resulting from the variable releases estimated in the FES (38 Ci/AFR/yr for the first 100 years, 47 Ci/AFR/yr for the next 400 years and 137 Ci/AFR/yr for periods beyond 500 years). Branagan, Tr. 3830.

61. Dr. Hamilton agreed with the Staff health effects from the uranium fuel cycle are minimal in comparison to background. Tr. 2378-79; Affidavit at 2. He estimated that the increased individual cancer mortality risk, based upon a 900 MW electric plant operating at 80% capacity, would be minute (5.13×10^{-11}). Prefiled Testimony Concerning the Health Effects of Uranium Mining and Milling at 6-7. He concluded that the incremental cancer risk from the uranium fuel cycle attributable to the Summer facility was very small, particularly in comparison to natural background. Id. at 7-9.

C. Dr. Morgan's Criticisms

(1) Risk estimators

62. The Intervenor, Staff and Applicant experts agree that the primary nuclides released during normal operation of a nuclear plant are low

linear energy transfer (LET) radiation. Morgan, Tr. 1652-53; Hamilton, Tr. 2327; Branagan, Tr. 2394-95. Dr. Morgan contends that the risks from low level exposure to ionizing radiation are greater than the Applicant and the Staff have estimated. Tr. 1548. He testified that in evaluating genetic effects the major radiation protection organizations rely largely on animal data and the general assumption that there is a dose rate effect factor at very low doses which makes the genetic risk about one-sixth of that at high doses. Tr. 1550. Dr. Morgan would to assume there is no dose rate effect and thus genetic damage would increase with an increase in dose. Tr. 1551. He argued that it is difficult to go from animal data to human health effects without reaching false conclusions due in part to the heterogeneity of the human population versus the animal population (i.e., there may be subgroups in the human population that are more radiosensitive than others). Tr. 1560-65. Dr. Morgan testified that studies show somatic effects are similar to those in man, but reveal different genetic effects. Tr. 1674-75.

63. Dr. Hamilton testified that animal studies are very useful in calculating the genetic risk to man in the absence of direct human evidence. Tr. 2364. The studies can reveal the shapes of dose effect relationship curves and the mechanisms by which radiation induces cancer or lesions in other animals. Tr. 2361-62. For example, animal studies have shown that a dose spread over a long period of time is not as harmful as the same dose given over a short period because the experiments have shown that repair mechanisms effect radiation damage. Id.; Tr. 2466. Dr. Hamilton agreed with Dr. Morgan that in calculating genetic effects one assumes, as a conservation, there is no repair mechanism so you do

not apply the dose rate effect factor of 6. Tr. 2362-63. The Staff also did not use a dose rate effect factor in its estimates of health effects. Branagan, Tr. 2399.

64. Dr. Morgan argued that the super linear dose model would give the most appropriate risk estimates of low level radiation because it recognizes that there are radiosensitive subgroups in the population. Tr. 1564. The super linear model of dose response shows that the cancer rate is greater, that is the number of potential cancers is greater at low doses than at high doses. Tr. 1664. He noted that a General Accounting Office (GAO) Report which was published subsequent to the BEIR III Report also selected the super linear hypothesis as the best fit for some data. Tr. 1570-71. Dr. Morgan commented that the linear risk model received a mixed review in the BEIR III report because some members argued that the linear response model overestimates the risk while others argued it underestimated the risk. Tr. 1570.

65. The Applicant and Staff witnesses rejected the claim that the linear model underestimated health effects. E.g. Hamilton, Tr. 2422; Branagan, Tr. 2394. They offered several reasons for rejected the super linear model to estimate health effects. Dr. Hamilton testified that he would not place more weight on the January 1981 GAO Report than on the 1980 BEIR Report solely because the former had a later publication date. Tr. 2420. He commented that a report prepared for budgetary purposes was not "in the same league as a scientific document." Id. In Dr. Hamilton's opinion the greater heterogeneity of the human population leads to the conclusion that the linear model is best. Tr. 2421-22.

The super linear model would only be better if a substantial number of people were supersensitive to radiation. Tr. 2421-22.[11/] Smokers are not supersensitive because smoking only adds to the risk of cancer. Hamilton, Tr. 2424. The BEIR III Report also concluded that the greater genetic diversity in humans than in inbred laboratory animals would favor a linear dose effect. Hamilton, Tr. 2367. Dr. Branagan testified that NRCP Report Number 64 recommends that a dose rate effectiveness factor be used in risk estimates for low-LET radiation. Tr. 2399. Thus, the failure of the Staff to use a dose rate effectiveness factor probably means health effects have been overestimated. Id.

66. Both Drs. Hamilton and Branagan agreed that the BEIR report had thoroughly reviewed the works of Dr. Bross, who attempted to identify groups with increased susceptibility to radiation, and concluded that Dr. Bross had not revealed any evidence to show that risks were greater than conventional estimates. Branagan, Tr. 2842-43; Hamilton Affidavit at 7-8. BEIR III also reviewed the Mancuso, Stewart and Kneale data on cancer risks and the Najarian and Colton study and found that the conventional risk estimates were not affected. Branagan, Tr. 2481-83; Hamilton Affidavit at 9.

67. Dr. Hamilton admitted that the BEIR I and III Reports have some inconsistencies in each report, but those inconsistencies do not effect the major conclusion regarding risk estimates. Tr. 2447. Both

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11/ Dr. Hamilton remarked that the relative risk model may apply to children up to 10 years of age, however, all the other cancer risk data is consistent with the absolute model. Tr. 2476-77.

Drs. Branagan and Hamilton emphasized that the absolute risk model was advocated in BEIR I, BEIR III, UNSCEAR 1977, UNSCEAR 1972, and ICRP Publication 26 for low-LET radiation, the type of radiation emitted from nuclear power reactors. Tr. 2478.

68. Dr. Morgan also argued that the standard setting bodies base their values almost entirely on the A-bomb survivor data from Hiroshima and Nagasaki, and the ankylosing spondylities data. Tr. 1552-53. Dr. Hamilaton testified that risk estimators are based almost entirely on human data which were thoroughly reviewed by UNSCEAR and BEIR committees Tr. 2326. The most useful data for deriving quantitative dose estimates are the Hiroshima and Nagasaki data. Id. Hamilton noted that Dr. Baum had tried to manipulate the Hiroshima-Nagasaki data to challenge the linear linear dose response curve for risk estimates, however, the BEIR I Report reviewed the data and maintained its support for the linear linear dose response curve. Hamilton, Tr. 2365-67.

(2) Validity of atomic bomb studies

69. Dr. Morgan testified that the BEIR report which the Applicant and Staff rely on for their risk estimates relies primarily on the atomic bomb data. Prefiled testimony at 5; Tr. 1552-53. The studies of the survivors of Hiroshima and Nagasaki had errors in dosimetry and thus, health effects were underestimated due to the high doses involved, the inadequate length of the study, and the failure of the BEIR committee to correct for the effects of trauma and fire blasts. Morgan, Tr. 1556-57; Prefiled testimony at 3-8.

70. Dr. Morgan viewed a May 22, 1981 article in Science (Attachment 3 to Branagan Rebuttal Testimony) as evidence that the doses were seriously overestimated. Prefiled testimony at 5. In Dr. Morgan's opinion, an overestimate of dose would yield fewer cancers per person-rem. Id. at 6. Hence, the linear model for dose response and the risk estimators that were derived from the atomic bomb data underestimate the health effects. Id. at 6-8. Dr. Morgan also argued that the Japanese survivors were a select population because they died of common diseases before they could contract cancer. Prefiled testimony at 3-4.

71. Drs. Hamilton and Branagan disagreed with the assertion that the Japanese data was unreliable and stated that the data was in general agreement with other human studies. Hamilton, Tr. 2343; Branagan Tr. 2396. Dr. Branagan also pointed out that the BEIR committee, contrary to Dr. Morgan's claim had considered the effects of fire blast and trauma. Tr. 2396; Branagan Rebuttal Testimony at 6. Both witnesses also rejected the May article as evidence that risk estimates should be changed. Both referred to a June 19, 1981 article in Science (Attachment 4 to Branagan Rebuttal Testimony) that rebuts the conclusion drawn in the May article by indicating that majority of the scientists in attendance the conference reported in the June article felt the change in risk estimates would only be slight. Branagan Rebuttal Testimony at 8-9; Hamilton, Tr. 2340-41. Both witnesses also noted that some of the principal authors of the studies reevaluating the atomic bomb data had written letters to the editor of Science to complain that the May article was misleading. Branagan Rebuttal Testimony at 8; Hamilton, Tr. 2341-42. The two experts did not

consider the May article, which appeared in the "News and Comment" section of the magazine and did not reference the reports themselves, as the kind of material on which experts would rely. Hamilton, Tr. 2342-43; Branagan Rebuttal Testimony at 7. Dr. Branagan also testified that the BEIR had found Dr. Morgan's hypothesis that a high infection rate existed was not supportable because, contrary to the assertion, there were no widespread epidemics in Hiroshima and Nagasaki. Tr. 2397.

(3) Validity of ankylosing spondylitis data

72. Dr. Morgan testified that the major radiation protection organizations largely base their values for risk estimates on the ankylosing spondylitis patient data. Tr. 1552-53. A major flaw in the data is that many of the patients die early of common diseases before they can develop cancer. Tr. 1557-58. Thus, there is a lower incidence of cancer among these patients and, consequently, the risk estimates recommended by radiation protection organizations that rely on this data underestimate cancer risks. Prefiled Testimony at 4.

73. Both Dr. Branagan and Hamilton testified that the major radiation protection organizations considered a wide body of data to derive their risk estimates. Hamilton, Tr. 2415; Branagan, Tr. 2396. Dr. Hamilton rebutted Dr. Morgan's hypothesis that most of the patients suffering from ankylosing spondylitis died of common diseases before developing cancer and noted that studies have shown that spondylitics have the exact same incidence of cancer as the normal population. Tr. 2356-61; 2449-57. Dr. Branagan further testified that, according to the the BEIR III Report, risk estimators based on exposure to high doses (e.g. the spondylitic data) may possibly overestimate the risks. Rebuttal Testimony at 7.

(4) Cost-Benefit Balance

74. In Section 9 of the FES (Staff's Exhibit 3) the Staff weighed the benefits of plant operation against a variety of costs. That section concludes that the "environmental and social costs of the plant are acceptable, and the total costs (including economic) are outweighed by the benefits of added capacity, energy produced, potential cost savings and increased reliability." Staff Exhibit 3, §9.7. Among the considerations leading to the favorable cost-benefit balance are the conclusions that the radiological effluents during plant operation are not expected to cause a measurable impact on the human population and the impact of the uranium feul cycle is insignificant in comparison to health effects in the U. S. population resulting from all background sources. Id., §§9.4, 9.5.

75. Dr. Morgan did not offer substantial evidence to challenge the favorable cost benefit. Nor does his testimony change the conclusion in §9.4 that the radiation releases of normal operation will not have a measurable impact on the humans. See Staff's Exhibit 3, §4.5.5; Hamilton, Tr. 2465. As Dr. Morgan candidly stated, a dose of one millirem--approximately the estimated maximum individual annual dose to any organ from operation of the Summer facility--adds a risk of dying of cancer, but it is a risk that is extremely small and should be balanced against the benefits. Tr. 1644-45, 1655.

76. The evidence shows that the Applicant and the Staff have not underestimated the health effects from normal operation of the Summer station and from the uranium fuel cycle so as to tip the favorable

cost-benefit balance struck at the construction permit stage. The risk estimates used in the FES are consistent with the recommendations of a number of the radiation protection organizations and are realistically conservative. We further find Dr. Morgan's cancer and genetic risk estimators considerably overestimates risks and represent a minority view of the health effects from low level ionizing radiation. Contrary to his assertions, the evidence shows that the reports relied upon by the Applicant and Staff based their conclusions on a wide body of statistical data and not solely the atomic bomb survivors and ankylosing spondylitis patient studies.

III. CONCLUSIONS OF LAW

Based upon the entire evidentiary record of this proceeding, and upon the foregoing Findings of Fact, the Board concludes the following:

(a) The Applicant possesses or has reasonable assurance of obtaining the funds necessary to cover the estimated costs of operation for the period of the license or for five years, whichever is greater, plus the estimated costs of permanently shutting down the facility and maintaining it in a safe condition pursuant to the requirements of 10 CFR § 50.33(f) (Contention 2).

(b) The Applicant has allocated an adequate sum for decommissioning (Contention 2).

(c) Quality control has been adequate and acceptable during the construction of the Summer plant. (Contention 9)

(d) The long-term health effects from plant operation at the permissible levels of 10 CFR Part 20 and Appendix I to 10 CFR Part 50 and the uranium fuel cycle, given the release values in Table S-3 of 10 CFR Part 51, have been reasonably estimated by the Staff and do not alter the favorable cost-benefit balance struck at the construction permit stage. (Contention 10)

IV. ORDER

WHEREFORE, in accordance with the Atomic Energy Act of 1954, as amended, and the Rules of Practice of the Commission, and based on the foregoing Findings of Fact and Conclusions of Law, IT IS ORDERED THAT this Partial Initial Decision shall constitute a portion of the ultimate Initial Decision to be issued upon resolution of the remaining contested issues in this proceeding.

IT IS FURTHER ORDERED, in accordance with 10 CFR §§2.760, 2.762, 2.764, 2.785, and 2.786, that this Partial Initial decision shall become effective and shall constitute, with respect to the matters covered herein, the final decision of the Commission 30 days after the date of issuance hereof, subject to any review pursuant to the above cited Rules of Practice. Exceptions to this decision may be filed within ten (10) days after service of this Partial Initial Decision. A brief in support of such exceptions may be filed within thirty (30) days thereafter, forty (40 days in the case of the Staff. Within thirty (30) days after service of the brief of appellant, forty (40) days in the case of the Staff, and

other party may file a brief in support of, or in opposition to, such exceptions.

THE ATOMIC SAFETY AND LICENSING BOARD

Herbert Grossman, Chairman

Gustave A. Linenberger, Member

Dr. Frank F. Hooper, Member

Dated at Bethesda, Maryland
this 18th day of September, 1981.

Respectfully submitted,

Steven C. Goldberg
Counsel for NRC Staff

Mitzi A. Young
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 18th day of September, 1981.

ATTACHMENT A

LIST OF EXHIBITS

(The Staff Adopts the List of Exhibits in Appendix A to Applicant's Proposed Findings of Fact and Conclusions of Law)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
SOUTH CAROLINA ELECTRIC & GAS COMPANY	)	Docket No. 50-395
	)	
(Virgil C. Summer Nuclear Station, Unit 1)	)	

NRC STAFF'S PROPOSED CORRECTIONS
TO THE TRANSCRIPT

Date	Page	Line	Change
6/26/81	1649	18	"list" to "risk"
	1650	25	"Young" to "Morgan"
	1653	19	delete "prefiled"
	1645	9	"Wouldn't" to "Wasn't"
7/2/81	2391	3	"Ativation" to "Activation"
	2394	15	"information" to "informally"
	2396	15	"this" to "the preceding"
	2397	16	"I quote" to "I quote from p. 355"
	2397	22	"may" to "are more likely to"
	2398	10	"there" to "my rebuttal testimony"
	2398	17	"article, and that's" to "article. Their letters are"
	2398	21	"a" to "in"
	2398	22	"the May 22" to "the title of the May 22nd"
	2411	9	"and for" to "For"
	2411	10	"and if" to "If"

Date	Page	Line	Change
	2411	16	"and so you're" to "You're"
	2411	19	"ten over" to "ten potential premature deaths from cancer over"
	2411	19	"period." to "period of radon releases."
	2411	22	"thousand for" to "thousand potential premature deaths from cancer due to"
	2412	17	"you" to "Dr. Hamilton"
	2412	18	"on-site" to "on-site doses"
	2440	16	"than" to "on"
	2461	19	"that" to "the estimated number of genetic effects presented in the FES"
	2462	10	"experience" to "exposure"
	2462	13	"0.3" to "0.3 potential genetic disorders"
	2463	5	"one annual fuel requirement" to "thirty annual fuel requirements"
	2463	23	"field level" to "fuel cycle"
	2470	8	"last 10 to 15 years" to "years 1974-1979"
	2470	9	"hasn't been any" to "was only one"
	2475	17	"that" to "the values of the major radiation protection organizations"
	2482	23	"They" to "The BEIR III Committee"
	2483	1	"population." to "population to detect health effects."
	2504	10	"1800 or something" to "1800 potential genetic disorders per million person-rem"

Date	Page	Line	Change
	2506	12	"value" to "genetic risk estimator"
7/13/81	2401	3	"KING" to "YOUNG"
	2401	6	"KING" to "YOUNG"
	2699	4	"and" to "an"
	2699	17	"We" to "we"
	2699	22	"plant to retain" to "plant; (2) retained"
	2699	24	"three" to "(3)"
	2702	18	"Woods" to "Wood"
	2702	20	"Woods" to "Wood"
	2721	2	"in" to "about"
	2721	4	"that that" to "that"
	2736	5	"the financial" to "the current financial"
	2736	7	"of the" to "exception of"
	2736	8	"commissioning" to "decommissioning"
	2738	12	"as" to "is"
	2741	13	"rate" to "rating"
7/14/81	2769	15	"Sullivan" to "Salomon"
	2769	23	"Sullivan" to "Salomon"
	2834	23	"Goldberg" to "Grossman"
	2835	1	"Goldberg" to "Grossman"
7/15/81	3089	24	"agreed" to "argued"
	3280	19	"contentions" to "changes"
	3282	5	"I guess" to "against"
	3283	6	"a document" to "documented"
7/16/81	3340	20	"brochure" to "information"
	3439	12	"find" to "point"

Date	Page	Line	Change
	3443	9	"Richardson" to "Kevern"
	3451	13	"plants" to "plans"
	3451	15	"plants" to "plans"
	3485	7	"dollars" to "examples"
	3490	20	"special" to "specific"
	3502	2	"COCHRAN" to "LENEHAN"
	3511	17	"Bradlee" to "Bradley"
	3512	6	"Givens" to "Gibbons"
	3512	7	"tham" to "that"
	3514	12	"concrete" to "equipment"
	3518	12	"them all" to "them"
	3518	24	"newe" to "new"
	3534	8	"subcontractor" to "subconstractors"
	3535	9	"39579-35-07" to "395/79-35-07"
	3535	19	"won't" to "was"
	3539	5	"50-395" to "50-395/80-07"
	3539	6	delete "8007"
	3541	7	"Inspectio" to "Inspection"
	3544	18	"and" to "has"
	3544	21	"had" to "and"
	3548	23	"botto" to "bottom"
	3567	10	"Analys of Licensing" to "Assessment of Licensee"

Date	Page	Line	Change
7/17/81	3760	17	"Goldberg" to "Grossman"
	3823	4	"FES. That is" to "FES, that is,"
	3823	5	"person-rem. With" to "person-rem; with"
	3823	15	"genetic estimator" to genetic risk estimator"
	3824	6	"10^2" to 10^{-2}"
	3824	18	"BIRE-1, BIRE-3" to BEIR-I, BEIR-3"
	3824	19	"UNSCAR" to "UNSCEAR"
	3825	16, 24	"BIER-1" to "BEIR-1"
	3827	9	"BIER-1" to "BEIR-1"
	3828	6, 21	"BIER-1" to "BEIR-1"
	3829	17	"1590" to "5190"

Respectfully submitted,

Mitzi A. Young
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 18th day of September, 1981

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter	)	
	)	
SOUTH CAROLINA ELECTRIC & GAS COMPANY	)	Docket No. 50-395
	)	
	)	
Virgil C. Summer Nuclear Station, Unit 1	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW IN THE FORM OF A PARTIAL INITIAL DECISION," and "NRC STAFF'S PROPOSED CORRECTIONS TO THE TRANSCRIPT" 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, by deposit in the Nuclear Regulatory Commission's internal mail system, this 18th day of September, 1981:

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