August 17, 1981

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:

SOUTH CAROLINA ELECTRIC & GAS COMPANY, et al.	)	Docket No. 50-395-OL
(Virgil C. Summer Nuclear Station, Unit 1)	)	

APPLICANTS' PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW IN THE FORM OF A PARTIAL INITIAL DECISION

In accordance with 10 C.F.R. §2.754, Applicants, South Carolina Electric & Gas Company and South Carolina Public Service Authority, hereby submit Proposed Findings of Fact and Conclusions of Law in the form of a Partial Initial Decision.

Respectfully submitted,

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[Applicants' Proposed
Findings, August 17, 1981]

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Herbert Grossman, Esq., Chairman
Mr. Gustave A. Linenberger, Member
Dr. Frank F. Hooper, Member

In the Matter of:

SOUTH CAROLINA ELECTRIC & GAS COMPANY, et al.	)	Docket No. 50-395 OL
(Virgil C. Summer Nuclear Station, Unit 1)	)	

PARTIAL INITIAL DECISION
(OPERATING LICENSE PROCEEDING)

I. BACKGROUND

1. This matter is a contested operating license proceeding within the meaning of 10 C.F.R. §2.4(n). This partial initial decision considers the application for issuance of a facility operating license to the South Carolina Electric & Gas Company ("SCE&G") and the South Carolina Public Service Authority ("SCPSA") (hereinafter "Applicants") to authorize the operation of the Virgil C. Summer Nuclear Station, Unit 1 ("the facility"). The facility consists of a single pressurized water reactor located on SCE&G's site in Fairfield County, South Carolina. The reactor is designed to operate at core power levels up to 2785 thermal megawatts, with a net electrical output of approximately 900 megawatts. (FSAR Ch. 3, §3.2, p. 3.2-1) The facility is adjacent to Monticello Impoundment, an SCE&G-owned and operated pumped storage hydroelectric project (Federal Energy

Regulatory Commission Project 1894), about one mile east of the Broad River and approximately twenty-six (26) miles northwest of Columbia, South Carolina. (FSAR, Ch. 2 §2.1.1, p.2.1-1, 2.1.2.)

2. On June 30, 1971, SCE&G, then the sole applicant filed an application with the Atomic Energy Commission, now the Nuclear Regulatory Commission,1/ (hereinafter "Commission" or "NRC"), for a permit to construct and operate the V.C. Summer Nuclear Station, Unit 1. Construction Permit No. CPPR-94 was issued on March 21, 1973, following reviews by the Commission's Regulatory Staff (hereinafter "Staff") and the Advisory Committee on Reactor Safeguards, as well as public hearings before an Atomic Safety and Licensing Board in Winnsboro, South Carolina on January 29-30, 1973.

3. On May 17, 1974, SCE&G filed an application to amend its construction permit to add SCPSA as co-owner and co-licensee, having executed a sale of a one third interest in the facility to SCPSA on October 18, 1973.

4. On January 30, 1979, construction permit CPPR-94 was amended to extend the completion date from January 1, 1978 to December 31, 1980. By letter dated November 26, 1980, Applicants requested further extension of the completion date to June 30, 1982. That timely request for renewal

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1/ Pursuant to the Energy Reorganization Act of 1974, 42 U.S.C. §5801, et seq., the Nuclear Regulatory Commission succeeded to the licensing and regulatory functions of the Atomic Energy Commission.

extended the construction permit until the request, which is still pending before the staff and not under the jurisdiction of this Board, is acted upon. 10 C.F.R. §2.109.

5. On April 18, 1977, the Commission published in the Federal Register (42 Fed. Reg. 20203) a notice of the receipt of an application by the Applicants for a facility operating license for the Summer facility. In response to that notice, Brett Allen Bursey (hereinafter "Bursey" or "Intervenor") filed a "Petition to Intervene" dated May 27, 1977. In that "Petition", Intervenor requested hearings. On July 15, 1977, an Atomic Safety and Licensing Board (hereinafter "Board") 2/ issued an Order granting Mr. Bursey leave to intervene.3/ On March 23, 1978, the Board issued a Memorandum and Order granting the State of South Carolina's March 10, 1978 petition to participate as an interested State pursuant to 10 C.F.R. §2.715(c).

6. The Board conducted a prehearing conference pursuant to 10 C.F.R. §2.751a (1st prehearing conference) on March 30, 1978 in Columbia, South Carolina. The Intervenor and the NRC Staff stipulated that a hearing should be held and that

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2/ Pursuant to Notice issued January 9, 1978, the Board was reconstituted to reflect appointment of Ivan W. Smith, Esq. to replace former Chairman Fredric J. Coufal, Esq. whose schedule did not allow him to continue in this case. Pursuant to Notice issued January 17, 1980, the Board was again reconstituted to reflect appointment of the current Chairman, Herbert Grossman to replace former Chairman Ivan W. Smith, Esq., whose schedule did not allow him to continue in this case.

3/ The intervention was granted over Applicants' objections as to timeliness and failure to submit a contention meeting the requirements of the NRC's regulations.

certain contentions were appropriate as issues in controversy. 4/ Applicants continued to oppose the intervention and all proposed contentions. On April 24, 1978, the Board issued a Prehearing Conference Order accepting twelve (12) contentions as issues in controversy (See n. 4), set a May 5 - September 15, 1978 discovery period and required motions for summary disposition to be served on or before October 3, 1978. 5/

7. During the course of the second prehearing conference on August 3, 1978, the Intervenor withdrew contention A5 (integrity of the service water pond dams) 6/.

8. On October 3, 1978 the NRC Staff filed a motion for summary disposition with respect to contentions A6 (failure adequately to consider impacts of thermal effluents and cooling water intake velocities, in the overall cost/benefit analysis required by NEPA) and A7 (liquid radioactive releases to the Broad River). On December 4, 1978 the Applicants filed a supporting answer and on April 9, 1979 the Board issued its Memorandum and Order Dismissing contentions A6 and A7.

4/ The numbering system designed by the Board for consideration of the stipulated contentions as subsequently modified by the Board (A2(a), A2(b), A3, A4(a), A4(b), A5, A6, A7, A8, A9, A10(a), A10(b)) was carried forward in later proceedings. Other contentions presented solely by Intervenor were denominated contentions B1, et seq., but were not allowed and consequently not carried forward.

5/ In a Memorandum and Order of August 6, 1979, the Board extended the time for moving for summary disposition until 45 days before the time set for hearing.

6/ Tr. 273.

9. On May 7, 1981 Applicants filed motions for summary decision on Intervenor's contentions A10(a) and A10(b) (radiation health effects) and A3 (ATWS), and the NRC Staff filed motions for summary decision on contentions A2(a) and A2(b) (financial qualifications to operate and decommission the Summer plant), A3(ATWS), and A4(b) (inadequacy of plans for monitoring site seismicity). By Order issued June 19, 1981, the Board denied all motions for summary disposition except the motions with respect to contention A3 (ATWS) 7/.

10. Thus, of the nine originally admitted contentions, only five remained for consideration in hearings. In addition, however, the Board sua sponte identified several other areas of interest which it requested Applicants to address during the hearings: management attitude (including the effect bringing in a co-owner may have on the responsibility SCE&G will be taking on with respect to completion of construction and proper operation of the facility (Tr. 321-23), hydrological interaction of the facility and the Fairfield Pumped Storage Facility (November 25, 1980 Third Prehearing Conference, Id.); Applicants' ALARA (As Low as Reasonably Achievable) program for minimizing occupational radiation exposure (Prehearing Conference Order dated April 24, 1978, pp. 11-12); and health effects from Radon 222 (November 25, 1980, Third Prehearing Conference, Tr. 300).

7/ Full explanation of the Board's reasons for granting summary disposition on this contention was reserved for the Initial Decision (Memorandum and Order, June 19, 1981, p.2) and is contained herein. In connection with our ATWS discussion, we also note the state of the record with regard to generic safety issues.

11. On March 23, 1981 an organization comprised of Fairfield County residents, Fairfield United Action (hereinafter "FUA"), filed a petition for leave to intervene, to which it attached twenty-seven proposed contentions and their bases. Applicants and NRC Staff opposed the petition. On April 30, the Board granted the FUA petition and accepted ten (10) of its contentions for litigation.8/ The ten accepted contentions related to two general subject matters - Applicants' management capabilities and adequacy of emergency planning efforts. Applicants and the NRC Staff appealed the Board's order admitting FUA. On June 1, 1981 the Atomic Safety and Licensing Appeal Board (ALAB) issued its decision reversing this Board's order insofar as it granted the intervention petition of FUA and remanding the cause with instructions to deny the petition as untimely.9/ FUA's subsequent petition to the Nuclear Regulatory Commission for review of the Appeal Board's decision has effectively been denied.10/ This Board, however, noted in the Appeal Board decision the Board's statement that "[i]nsofar as they [FUA contentions] overlap either matters placed in controversy by Mr. Bursey or issues

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8/ Partial Order Following Prehearing Conference (Admitting FUA on Contentions 1, 2, 7-13 and 27, and Denying FUA's Other Contentions).

9/ ALAB-642.

10/ As required, this Board issued an Order on June 3, 1981 denying FUA's petition to intervene. On June 5, 1981 FUA filed an application for a stay of the Appeal Board's decision. Applicants and Staff opposed it. By Memorandum and Order of June 15, 1981 the Appeal Board denied FUA's application for a stay. (ALAB-643) FUA filed a petition for review of the Appeal Board's decision with the Commission on June 15, 1981 and on June 16, 1981 filed an application for a stay pending that review. The Commission, by Memorandum and Order served June 19, 1981 denied the stay application. The (Continued on page 7)

raised by the Board sua sponte . . ., it will be the Board's responsibility to require their adequate evidentiary exploration." (ALAB-642, p. 25).

12. On June 19, 1981 this Board issued an order denying a June 4, 1981 Staff motion to strike, among other things, FUA's May 28, 1981 prefiled testimony. As we stated, we believe that ". . . fairness require[d] that we permit the remaining intervenor to utilize whatever of FUA's testimony he desire[d]". In fact, Intervenor called Dr. Ruoff as a financial witness, but he disclaimed expertise and his prepared testimony was not received (Tr. 2744). This opportunity, together with our own inquiries into these matters during the course of hearings, has provided "adequate evidentiary exploration" of these issues.

13. In the course of events since the filing of the operating license application there have been four prehearing conferences, all conducted in Columbia, South Carolina: March 30, 1978; August 2-3, 1978 11/; November 25, 1980; and April 7-8, 1981.

10/ (Continued from page 6) time for Commission review of the Appeal Board decision was extended by Orders of the Commission of July 9, 1981 and July 15, 1981 to July 20, 1981, and July 29, 1981 respectively. July 29 passed without Commission action to grant the petition or further extend the time for Commission review. Thus, by §2.786(b)(5) of the Commission's Regulations, the petition is deemed to have been denied as of July 29, 1981. This was confirmed in a letter of July 31, 1981 from the Secretary of the Commission to FUA's designated representative, Dr. John C. Ruoff.

11/ This conference was conducted in conjunction with the taking of depositions in camera (the transcripts of which were later made part of the public record; Tr. 1436) of certain of Intervenor's proposed witnesses on the subject of deficient construction and construction practices and was not per se scheduled as a formal prehearing conference.

In addition, several telephone conferences were held to discuss primarily procedural as well as other matters. Through approved two-party stipulation, prehearing conferences and related orders, telephone conferences, summary disposition and voluntary withdrawal, the issues, including contentions and Board questions for hearing, emerged finally as follows:

Intervenor Contentions

Contention A2 (a) The Applicant lacks the financial qualifications necessary to safely operate and decommission the Summer station in compliance with NRC rules and regulations;

(b) The sum allocated by the Applicant for the 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).

Contention A4 (a) The FSAR is inadequate with respect to the description of seismic activity in the area of the Summer Plant site;

(b) The plans for monitoring site seismicity are inadequate in that they do not consider the seismic effect of filling the reservoir. Site seismicity monitoring conducted after the filling of the reservoir should be continued through 1983.

Contention A8 The Applicant has made inadequate preparations for the implementation of his emergency plan in those areas where the assistance and cooperation of state and local agencies are required.

Contention A9 The quality control of the Summer plant is substantially below NRC standards as evidenced by consistently substandard workmanship, in several aspects, during the construction of the plant.

Contention A10 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.

Board sua sponte issues

(1) (a) Management attitudes within the applicant's organization with respect to completing and operating the facility;

(b) The effect the existence of a co-owner will have upon the responsibility SCE&G will be taking with respect to completion of construction and proper operation of the facility.

(2) Interaction hydrologically between the Summer facility and the Fairfield pumped storage facility. (In part related to A4).

(3) Long-term health effects consideration of Radon 222. (Related to A10, but not a part thereof).

(4) Applicants' ALARA (As low as Reasonably Achievable) program for minimizing worker exposure to radiation. (Somewhat related to A10 but not a part thereof).

14. Hearings on these contentions and issues were conducted on June 22-26, June 30 - July 2, and July 13-17, 1981. These thirteen (13) days of hearings included several evening sessions. Seventy-four (74) witnesses testified, sixty-three (63) exhibits were admitted and 3,882 pages of transcript were compiled. The record was closed on all contentions and issues except for contentions A4(a) and (b) (seismic) and A8 (emergency planning). Further hearings on these contentions are tentatively scheduled for the week of September 21, 1981.

15. This is a partial initial decision as to those contentions and issues for which the record has been closed: A2(a) and (b) (financial qualifications to operate and decommission the facility); A9 (construction deficiencies); A10(a) and (b) (health effects of the fuel cycle and plant operation); the related board questions on ALARA and radon; management attitudes including the impact of co-ownership on management; and the Board question on hydrology, except to the extent the

remaining Board questioning of the panel on lowering the reservoir may be considered a hydrological consideration. Additional evidence on contentions A4 (seismicity) and A8 (Emergency Plans) remains to be heard. We now turn to our findings on the issues decided herein.

Intervenor Contention A2

(a) The Applicant 12/ lacks the financial qualifications necessary to safely operate and decommission the Summer Station in compliance with NRC rules and regulations.

(1). The legal standard

16. Section 182 of the Atomic Energy Act, 42 U.S.C. §2232, authorizes the Commission to decide whether the applicant is financially qualified to perform the activities required under the license:

> Each application for a license hereunder ... shall specifically state such information as the Commission, by rule or regulation, may determine to be necessary to decide such of the technical and financial qualifications of the applicant...as the Commission may deem appropriate for the license. 42 U.S.C. §2232(a) [emphasis added].

17. Pursuant to §182, the NRC promulgated §50.33(f) requiring the applicant to show that it

> 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 5 years, whichever is

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12/ Intervenor presented this contention as if there were a singular applicant, SCE&G, who is subject to state and federal ratemaking jurisdiction; hence, his use of the singular form of "Applicant". In fact, SCE&G is joint applicant with SCPSA, which is not subject to state or federal ratemaking authority but is a nonprofit-making agency of the State of South Carolina regulated only by a Board of Directors (Tr. 2877, 2884; SER Supplement No. 1 §20.2).

> greater, plus the estimated costs of permanently shutting the facility down and maintaining it in a safe condition.

In Part 50, Appendix C, the Commission adds:

> [I]t will ordinarily be sufficient to show at the time of the filing of the application, availability of resources sufficient to cover estimated operating costs for each of the first 5 years of operation plus the estimated costs of permanent shut-down and maintenance of the facility in safe condition. It is also expected that, in most cases, the applicant's annual financial statements contained in its published annual reports will enable the Commission to evaluate the applicant's financial capability to satisfy this requirement.

18. The Commission addressed the "reasonable assurance" requirement of §50.33 and Appendix C in Public Serivce Company of New Hampshire, 7 NRC 1 (1978) (Seabrook). There, the Commission explained that

> [i]t is not enough that the applicant is a regulated public utility. On the other hand, given the history of the present rule and the relatively modest implementing requirements in Appendix C, a 'reasonable assurance' does not mean a demonstration of near certainty that an applicant will never be pressed for funds in the course of construction. It does mean that the applicant must have a reasonable financing plan in the light of relevant circumstances.

While Seabrook involved a construction permit, the standard established there also applies to the issuance of an operating license, but the difficulty of establishing financial assurance for operation is even less than at the construction permit stage, at least for organizations having revenues from sales to cover operating costs. This is because during construction the applicant usually puts up its own (including investors' and internally generated funds as well as borrowed funds) money for the unit and does not begin to recover its costs through its rates until the

unit goes on line--that is, after an operating license has been issued.

19. In sum, under §50.33(f) and Appendix C, the applicant ordinarily has to prove that it has a "reasonable assurance" of obtaining funds (a) to operate the plant for each of the first five years of operation, and (b) to decommission the facility permanently and maintain it in a safe condition. In addition, under Seabrook, reasonable assurance does not mean proving that the applicant will never be pressed for funds. Rather, it means the applicant must have a reasonable financing plan under the circumstances.

2. The evidence

20. The Applicants presented prefiled financial testimony of Oscar S. Wooten, Vice President--Finance for SCE&G, Kenneth R. Ford, Vice President, Finance, and Treasurer for SCPSA and Douglas C. Warner, Manager, Nuclear Fuel Management, Nuclear Services Department, SCE&G. 13/ Applicants also provided extensive financial information pursuant to 10 C.F.R. §50.33(f)

13/ Although bound into the transcript as if read, the prefiled testimony and statements of professional qualifications in this proceeding were not included in transcript pagination. They retained their own pagination. Hence, page references to prefiled testimony or statements of professional qualification after initial indications as to location in the transcript, will be to the independent prefiled pagination. O.S. Wooten's prefiled testimony appears following Tr. 2542 and consists of nine (9) pages. His statement of professional qualifications follows immediately thereafter. The prefiled testimony of

(Footnote continued on next page.)

and Appendix C to Part 50. See Applicants' Exhibits 16 (SCE&G's annual report for 1980, Tr. 2547, 2551), 17 (answers to Staff questions, Tr. 2547, 2551), 18 (SCPSA's annual report for 1980, Tr. 2554), 19 (exhibits to O.S. Wooten's prefiled testimony in the currently ongoing SCE&G rate case before the PSC, Tr. 2637) (which completes Intervenors' Exhibit 6) and 35 (License application, Tr. 3818).

21. The NRC Staff presented as its testimony §20 of Supplement No. 1 to the Safety Evaluation Report, designated NUREG-0717 (Staff Exhibit 1(a)). Mr. James C. Petersen, Senior Financial Analyst in the Office of State Programs, U.S. Nuclear Regulatory Commission, testified as sponsor of that document.

22. Intervenor offered the testimony of Dr. John Ruoff. But since Ruoff professed no expertise or special knowledge as to Applicants' financial condition, the Board granted the motions to strike of Applicants and Staff and allowed his testimony only as a limited appearance statement. (Tr. 2744). Intervenor did offer as an exhibit, however, the prefiled testimony of Applicants' witness Mr.Wooten in the current rate case before the PSC (omitting the tables which formed a part of the testimony -- these were supplied by Applicants' Exhibit 19)(Tr. 2637) which the Board accepted and marked as

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(Footnote continued from previous page.)

Kenneth R. Ford appears following Tr. 2553 and consists of three (3) pages. Douglas C. Warner's prefiled testimony consists of five (5) pages plus one table and his statement of professional qualifications, and immediately follows that of Mr. Wooten.

Intervenor's Exhibit 6. (Tr. 2577, 2584).

23. The Board discusses below the evidence presented on (a) the estimated costs of operating the Summer facility, (b) the estimated costs to decommission the facility and (c) the Applicants' financial plan to pay for those operating and decommissioning costs.

A. The estimated costs of operating the Summer facility

24. The Applicants estimated the annual operating costs 14/ for the Summer facility for each of the first five years of operation. Applicants assumed that 1983 will be the first full year of operation, that the facility will have a net peak capacity of 900 MW and that its original cost will be $1,031.9 million (Applicant Exhibit 17). Staff summarized Applicants' estimates in Table 20-1 of Supplement 1 to SER (Staff Exhibit 1(a)):

14/ The operating costs include all costs associated with the capital investment and operation and maintenance including nuclear fuel.

TABLE 20-1

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

Applicants' Estimate	Year 1983	1984	1985	1986	1987
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

25. Although Intervenor offered no evidence as to the estimated costs of operating the facility, he did raise a question at the hearing regarding whether those estimates should reflect the steam generator replacement problems which occurred at the Surrey and Turkey Point facilities. (Tr. 2603). Applicants' witness Warner testified that no such problem is expected (Tr. 2603-04). The problem at Surrey and Turkey Point was caused primarily by chlorides (salt or brackish water) in their outside coolant water. (Id.). Applicants will use the low chloride content water from the Broad River as a coolant. (Tr. 2604). As added assurance, Applicants have installed demineralizers, similar to those now installed at Surrey and Turkey Point, to help keep the chloride level low. (Id.).

26. Both Applicants and Staff concluded that operating costs will be routinely recovered through rates. See §C infra.

B. Estimated costs to decommission the Summer facility

27. The NRC has developed three basic alternatives for decommissioning of nuclear reactors: mothballing, entombment

and dismantlement. 15/ The Applicants have not at this time selected a specific decommissioning method. The NRC does not require a specific method, and it is uncertain which method will be selected and approved. (Wooten Testimony, p. 2). The important point is whether applicants have a reasonable plan to cover the costs associated with these optional methods. (SER Supp. 1, § 20.5, Staff Exhibit 1(a)).

28. Applicants presented evidence showing a range of decommissioning costs from $1 million (plus an annual maintenance charge of $100,000) for the lower level of decommissioning, to $70 million (1978 dollars) for a complete dismantlement shortly after the useful life of the facility (Wooten Testimony, p. 3; Warner Testimony, pp. 2-3). 16/ Applicants expect periodically to adjust their cost estimates to account for inflation, regulatory changes, technological improvements and any other variable which may impact upon the continued validity of their cost projections. (Warner Testimony, p. 3)

29. Staff adopted Applicants' $70 million maximum estimate as a conservative figure for use in assessing

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15/ Mothballing would encompass removing the fuel and radioactive waste and then placing the facility in protective storage. Entombment consists of sealing the reactor with concrete or steel after all liquid waste, fuel and surface contaminated materials have been removed and sent to fuel storage facilities or burial grounds. Dismantlement involves the total removal of the facility from the site to radioactive burial grounds. The land is then restored to its original condition and released for unrestricted use. (Wooten Testimony, p. 2).

16/ The underlying bases of these figures are explained in detail in Mr. Warner's Testimony at pp. 2-3.

financial qualifications. (Staff Exhibit 1(a); § 20.4 of Supplement No. 1 to the SER). Staff explained (Id.):

> Under contract for the NRC, the Battelle Pacific Northwest Laboratory issued its report "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 (June 1978). In both this report and its August 1979 Addendum the Battelle Laboratory estimated the costs of decommissioning various types of reference pressurized water reactors under various types of decommissioning methods. The maximum cost of decommissioning for the immediate dismantlement method was estimated by Battelle to cost a total of $39 million. Accordingly, as an element of conservatism, the applicants' $70 million maximum estimate of decommissioning expenses has been adopted herein as the basis in evaluating its ability to finance such amounts.

30. Intervenor offered no evidence challenging the $70 million estimate for decommissioning the Summer facility. But in his limited appearance, Dr. John Ruoff contended that the $70 million estimate should be adjusted for inflation. (Tr. 2746). He applies inflation rates of 7 percent and 14 percent for a 30-year period to the $70 million estimate to derive a range between $733.7 million and $4.9 billion for decommissioning. (Tr. 2746). But, as Staff witness Petersen testified, trying to predict inflation rates 20 or 30 years from now is "so speculative that it is not very meaningful." (Tr. 2738). As noted above, Applicants testified that they would periodically adjust their estimates for inflation, technological changes and other variables. (Warner Testimony, p. 3; Wooten Testimony, pp. 5-6).

31. We discuss next the manner in which Applicants plan to recover the costs of operation and, assuming necessary regulatory approvals in the case of SCE&G and Board of Directors approval in the case of SCPSA, decommissioning.

C. Applicants' financial plan

32. Both the SCPSA and SCE&G propose to recover the operating costs for each of the first five years of facility operation, and the cost to decommission the facility at the end of its normal life, through their rates for sales of power and energy (see SER Supplement No. 1 §20, Applicants' Exhibit 17, and prepared testimony of Wooten and Ford). Under the Joint Ownership Agreement, SCE&G and SCPSA will share such costs in proportion to their ownership interests: 66.667 percent for SCE&G and 33.333 percent for SCPSA. (Applicants' Exhibit 20, Tr. 2872).

33. Recovery of such costs for SCPSA is a relatively simple matter, since SCPSA is subject to neither state nor federal rate jurisdiction. It has the authority unilaterally to increase its rates to recover such costs (Ford Testimony, p. 2). Indeed, it has a legal obligation to do so. Its bond indentures and basic expansion bond resolution require it to establish, maintain and collect sufficient rates to pay, among other things, any and all amounts, including operation and maintenance expenses, which it is obligated to pay by law or contract. (Ford Testimony, p. 2).

34. To recover its share of the operating and decommissioning costs of Summer, SCE&G will file rate changes with the Public Service Commission ("PSC") of South Carolina, which regulates its retail rates (comprising about 96 percent of its electric business), and with the Federal Energy Regulatory Commission ("FERC"), which regulates its wholesale rates (comprising

about 4 percent of its business). (Wooten Testimony, pp. 2-3).

35. Both SCPSA and SCE&G expect to propose unfunded negative net salvage as the ratemaking method for funding decommissioning costs. 17/ (Ford Testimony, pp. 1-2; Wooten Testimony, p. 4). SCE&G noted that their proposal for negative net salvage would be subject to the approval of the South Carolina PSC and the FERC. (Wooten Testimony, p. 4). 18/

36. Under the negative net salvage method, SCPSA will collect from the ratepayers the annual decommissioning cost through deferred maintenance expense, whereas SCE&G will recover it through depreciation expense. (Wooten Testimony, p. 7). Applicants will periodically review decommissioning costs to reflect changes in economic conditions and technology. (Wooten Testimony, pp. 6-7). The unfunded reserve will provide Applicants with additonal capital to build new facilities. When Summer is decommissioned at the end of its normal life, Applicants will use the value of the new facilities as collateral for the issuance of bonds to pay for the decommissioning. 19/ (Wooten Testimony, p. 6). The

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17/ Other rate methods for funding decommissioning are prepayment, external funding and internal sinking fund depreciation. (Wooten Testimony, p. 4).

18/ We note that Henry Cyrus of the SCPSA testified that he assumed SCPSA will place the revenue collected for decommissioning in a fund. (Tr. 2873-4). Mr. Cyrus, however, was neither offered nor qualified as a financial witness but rather as a witness on contractual matters. Mr. Ford, whose testimony was unchallenged, was the only financial witness offered by SCPSA. Thus, the Board disregards Mr. Cyrus' statement regarding decommissioning and relies on Mr. Ford's testimony.

19/ Applicants also have the option of raising capital through stock issuances, short term debt or internally generated funds. (Staff Exhibit 1(a)).

theory of the method is to have the ratepayers who are currently using the facility pay their share of the decommissioning cost and, at the same time, improve the cash flow of Applicants, thus reducing Applicants' need to raise capital at today's high prices for their construction programs. (Id.)

37. Staff found that the financial plan of SCPSA and SCE&G, i.e. their plans to meet the estimated operating costs for each of the first five years of operation and to meet the estimated cost of decommissioning at the end of the normal life of the facility, satisfies the reasonable assurance requirement of §50.33(f) and Appendix C. (Staff Exhibit 1(a)). Staff witness Petersen testified SCE&G has consistently obtained adequate rates to cover all its operating costs and earn a profit (Tr. 2720):

> The company has in every one of those years [in the last two decades] fully recovered all costs of operation of all their facilities and has in fact in every one of those periods earned a profit. That shows to me the rates allowed by the Public Service Commission were certainly adequate to pay all operating expenses, and whatever decommissioning expenses of other types of facilities were necessary during that period.

Further, he testified that South Carolina PSC has adhered to the Supreme Court's landmark ratemaking decisions which guarantee the utility an opportunity to recover all reasonable costs incurred in providing service:

> I also looked at the most recent rate order of the Public Service Commission, which enunciated . . . in considerable detail...their longstanding and continued commitment to the principles established in the U.S. Supreme Court landmark decisions in the Hope and Bluefield cases..." (Tr. 2720).

38. Staff found that the historical and present financial strength of SCPSA and SCE&G reinforced its conclusion that Applicants had the necessary financial ability. (Staff Exhibit 1(a); §20.7 of Supplement No. 1 to SER). Staff noted that during the past 13 years SCPSA and SCE&G have completed about $1.2 billion of external financing. (Id.). They accomplished these financings without restrictions during a period of chaotic market conditions with both entities maintaining their investment quality ratings, "A" for SCE&G and "A1" and "A+" for SCPSA. 20/ (Id.). Staff found of particular importance the fact that during the last eight years, 1973-80, of this thirteen year period, the two companies have been able to finance the construction of the Summer facility at an estimated cost to date of $825 million. (Id.). Staff agreed with Applicants that if they are financially able to raise $825 million in eight years to construct this plant in addition to their other construction requirements, there is a reasonable assurance they will be able to decommission the nuclear plant at the end of its useful life. (Id.).

39. Staff also found that as of November 30, 1980, SCE&G had assets of $1.8 billion, operating revenues of $627.2 million and retained earnings of $128.0 million, while the SCPSA had assets of $1.4 billion, operating revenues of $178.2 million and retained earnings of $121.6 million. (Staff Exhibit 1(a); §20.7 of

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20/ In June 1981, Standard and Poors downgraded SCE&G's bonds from A to A- (Tr. 2531). Moody's made no change, nor did Duff & Phelps. (Id.).

Supplement No. 1 to SER). Annual decommissioning costs will be less than 0.2 percent of the 1980 revenues of SCE&G and slightly more than 0.3 percent for the SCPSA. (Id.). Considering the size of their operations, Staff found SCPSA and SCE&G clearly should be able to meet their share of the decommissioning costs. (Id.)

40. During the hearing, this Board raised several questions regarding whether the funded approach for decommissioning was preferable to the unfunded negative net salvage method proposed by the Applicants. Staff found that the unfunded negative net salvage method, which is widely used for recovering decommissioning costs, was a valid approach here. (Tr. 2703). Staff noted that the NRC regulations presently do not require any specific method for funding decommissioning, but that the Commission is currently studying the matter. (Tr. 2704). Staff witness Peterson testified that in his view--speaking generically and not as to the present case--a funded approach provides greater financial assurance than the unfunded approach. (Tr. 2740). But he found nothing about the circumstances of this case which would lead him to believe that Applicants especially need the greater financial assurance of a funded approach. (Id.). In fact, in view of the South Carolina PSC's financial and rate regulation of SCE&G, he had no reason to believe that the funded approach would provide greater security here than the unfunded method. (Tr. 2710).

41. During the hearing, concern was expressed as to whether future ratepayers at or after the useful life of the facility would be unfairly burdened by the use of new plant facilities as

collateral for bonds issued to pay for decommissioning. (See, e.g., Tr. 2732). Future ratepayers, however, will not be unfairly burdened because they benefit from the new facilities and therefore should pay the costs of those facilities, including the capital costs reflected by the bond issuance. (Tr. 2733). The negative net salvage approach has the effect of delaying the incurring of those capital costs until the need for decommissioning arises.

42. Concern was also expressed as to whether there would be property available for use in issuing bonds for decommissioning. But this concern was also unfounded, since, as Applicants' witness Wooten explained, the South Carolina PSC in regulating SCE&G's financing and rates would insure the availability of funds for decommissioning. (Tr. 2617-18). Further, Applicants do not have to rely exclusively on a bond issuance to pay for decommissioning, but have access to other forms of capital such as common stock, preferred stock, short term debt and internally generated cash. (Staff Exhibit 1(a); §20.7 of Supplement No. 1 to SER).

43. The question of the tax treatment of negative net salvage was also raised. Applicants' witness Wooten understood that the IRS is presently considering the tax treatment of the annual decommissioning expense. (Tr. 2568-69). Mr. Wooten said the negative net salvage approach assumes favorable tax treatment, but if that assumption turns out to be incorrect, and cannot be changed, the Company would propose to the federal and state rate commissions a change in the method for funding decommissioning as to obtain a more favorable result, i.e. least costly

to the ratepayers. (Tr. 2567; see also Tr. 2627-28). 21/

44. This Board also raised a number of questions at the hearing regarding whether Applicants could financially withstand either premature decommissioning or a TMI-2 type accident. Staff witness Petersen testified that the NRC regulations do not require the applicant to show reasonable assurance of obtaining funds to prematurely decommission the facility; the regulations' reference to "permanent shutdown" has consistently been interpreted as shutdown at the end of the facility's normal life. (Tr. 2724). In any event, Mr. Petersen explained that the Applicants could obtain funds to prematurely decommission the plant in several ways: issuance of debt using bondable property acquired to date under negative net salvage; other issuance of debt, both long and short term; issuance of common and preferred stock; use of internally generated cash from depreciation, investment tax credits, tax normalization and retained earnings. (Tr. 2724-25). Applicants' witness Wooten had noted that rate increases would be sought for the additional costs related to the premature decommissioning. (Tr. 2562-63). In the past,

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21/ It should be noted that if the IRS treats the annual decommissioning cost as income and not as a deduction, the resulting tax expense (hypothetically 46 cents on the dollar) would be recovered in the rates as an additional expense. This would be in accordance with standard ratemaking practice under the Hope line of cases, discussed infra, guaranteeing the utility an opportunity to earn all reasonable costs of doing business.

the PSC of South Carolina has allowed for recovery of similar unexpected costs. (Tr. 2562).

45. With respect to a TMI-2 type accident, Mr. Peterson testified that the ability to withstand it would depend on the severity of the accident, how much money was needed and how quickly the money was needed. (Tr. 2721). Aside from a government bailout, he said the Applicants could conceivably issue long term debt; GPU did so within several months of the accident. (Tr. 2722). In addition, he said short term debt would probably be available to obtain immediate cash to begin maintaining the plant in a safe condition. (Id.). He found that Applicants are in better financial condition than GPU was at the time the TMI-2 accident. (Tr. 2722-23). GPU, of course, is still functioning despite the accident and its related costs. (Tr. 2612).

46. On this subject, Mr. Wooten testified that legislation has been introduced to provide a combination of federal, state and industry assistance to alleviate the financial impact of a TMI-2 type accident; that insurance programs to cover this type of situation are being formulated; and that as a result of these efforts SCE&G would be in a better position than GPU. (Tr. 2613).

47. Finally, in his limited appearance statement, Dr. Ruoff contended that Board should seriously examine SCE&G's proposed unfunded decommissioning method, alleging that SCE&G was in poor financial condition. (Tr. 2744-46). He contends that SCE&G is suffering from, inter alia, an inability to issue

preferred stock, poor bond coverage, sales of common stock below book value and continuing erosion in investor confidence, citing as support Mr. Wooten's prefiled testimony in the current SCE&G rate case (Intervenor Exhibit 6). (Id.). But, as Mr. Wooten pointed out and as is reflected in a reading of all of Mr. Wooten's prefiled testimony in the current rate case, these problems would occur only if the South Carolina PSC failed to grant rate relief. (Applicants' Exhibit 19 and Tr. 2555-56). As noted above, the SCPSC has consistently provided SCE&G with sufficient rate relief.

48. Dr. Ruoff also cites the high reserve margin on SCE&G's system as evidence that it will not obtain rate base treatment for Summer. But in the last rate case the South Carolina PSC found that the reserve margin was reasonable and that Summer was a prudent investment warranting rate base treatment. South Carolina Electric and Gas, PSC Docket Nos. 79-196-E et al. Order No. 80-375, issued June 30, 1980. We were advised that this decision was recently upheld on appeal. (Tr. 2621).

3. Findings and Conclusions

49. The Board endorses the Staff's findings and concludes that in accordance with §50.33(f) and Part 50, Appendix C, Applicants have reasonable assurance of obtaining funds to operate the facility for each of the first five years of operation and to decommission the facility permanently and maintain it in a safe condition at the end of the

facility's normal life. In reaching this conclusion, the Board accepts for this purpose, as did the Staff, Applicants' estimates of the costs of operating and decommissioning the facility. 22/

50. The Board finds that Applicants' plan to recover such costs through their rates in sales of power and energy provides the "reasonable assurance" required under §50.33(f) and Appendix C. SCPSA should experience no trouble recovering its share of such costs since it is not subject to rate regulation and can unilaterally increase its rates. Although SCE&G must seek rate increases before the South Carolina PSC and the FERC to recover its share of such costs, it is highly likely that it will be able to do so. Over the last 20 or more years the South Carolina PSC consistently granted sufficient rate relief to SCE&G to enable it to recover all its operating costs plus a return on its investment.

51. Moreover, the South Carolina PSC (like the FERC) adheres to the landmark Supreme Court decisions on ratemaking--that is, the Hope line of cases. The importance of these cases cannot be overemphasized here in evaluating the financial qualifications of SCE&G.

22/ All of the Board's findings in this section are based on the evidence discussed in the preceding section.

52. In FPC v. Hope Natural Gas Company, 320 U.S. 591 (1944), the Court summarized the criteria to be employed by commissions in setting rates 23/:

> Thus we stated in the Natural Gas Pipeline Co. case that 'regulation does not insure that the business shall produce net revenues.' 315 U.S. p. 509. But such considerations aside, the investor interest has a legitimate concern with the financial integrity of the company whose rates are being regulated. From the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. These include service on the debt and dividends on the stock. Cf. Chicago & Grand Trunk Ry. Co. v. Wellman, 143 U.S. 339, 345-346. By that standard the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital. See Missouri ex rel. Southwestern Bell Tel. Co. v. Public Service Commission, 262 U.S. 276, 291 (Mr. Justice Brandeis concurring).

23/ Hope, 320 U.S. at 603.

Significantly, the Court in the passage quoted above cited the concurring opinion of Mr. Justice Brandeis (in which Mr. Justice Holmes also concurred) in Southwestern Bell Telephone. 24/ There Mr. Justice Brandeis stated (at 290-291):

> The thing devoted by the investor to the public use is not specific property, tangible and intangible, but capital embarked in the enterprise. Upon the capital so invested the Federal Constitution guarantees to the utility the opportunity to earn a fair return. Thus, it sets the limit to the power of the State to regulate rates. The Constitution does not guarantee to the utility the opportunity to earn a return on the value of all items of property used by the utility, or of any of them.
>
> The investor agrees, by embarking capital in a utility, that its charges to the public shall be reasonable. His company is the substitute for the State in the performance of the public service, thus becoming a public servant. The compensation which the Constitution guarantees an opportunity to earn is the reasonable cost of conducting the business. Cost includes not only operating expenses, but also capital charges. Capital charges cover the allowance, by way of interest, for the use of the capital, whatever the nature of the security issues therefor; the allowance for risk incurred; and enough more to attract capital. The reasonable rate to be prescribed by a commission may allow an efficiently managed utility much more. But a rate is constitutionally compensatory if it allows to the utility the opportunity to earn the cost of the service as thus defined [Footnote omitted]..

24/ Missouri ex rel. Southwestern Bell Telephone Co. v. Public Service Commission, 262 U.S. 276.

53. The Supreme Court has followed Hope in Permian Basin Area Rate Cases, 390 U.S. 747, reh. denied, 392 U.S. 917 (1968) and FPC v. Memphis Light, Gas & Water Division, 411 U.S. 458 (1973); see also Farmers Union Central Exchange v. Federal Energy Regulatory Commission, 584 F.2d 408 (D.C. Cir. 1978), cert. denied, 439 U.S. 995 (1978). The South Carolina PSC and the FERC also follow the Hope criteria. E.g., South Carolina Electric & Gas Co., PSC Docket Nos. 79-196-E, et al., Order No. 80-375, issued June 30, 1980 at 54-56; Minnesota Power & Light Co., Opinion 12, FERC Docket No. E-8494, issued April 14, 1978 at 11.

54. In sum, Hope establishes that in providing service pursuant to its public service obligation, a utility is guaranteed an opportunity to recover all its operating and maintenance expenses plus a fair return on its investment; otherwise, its property is "taken" in violation of the Constitution. Cost recovery under the Hope criteria assumes that such costs are prudently incurred--an assumption we make here regarding the operating and decommissioning of the facility. 25/

25/ If this assumption is not made, it would be virtually impossible for an applicant to meet the financial qualification requirement, since a utility cannot recover imprudently incurred costs in its rates. It is for this reason that the assumption of prudence is implicit in the Atomic Energy Act, the purpose of which is to license nuclear plants, not regulate rates. See §271 of the Act, 42 USC §2018, discussed next.

55. Reinforcing the financial ability of the Applicants to pay for operating and decommissioning the facility is their strong historical and present financial condition.

56. As to the ratemaking method for funding decommissioning, we find that the NRC regulations do not require any specific method. Moreover, we hold that the NRC lacks the jurisdiction to require a specific ratemaking method for funding decommissioning. This is a matter within the exclusive jurisdiction of the federal and state ratemaking agencies. Section 271 of the Atomic Energy Act, 42 U.S.C. §2018, explicitly preserves the ratemaking jurisdiction of the states and the FERC, providing that nothing in the Act affects "the authority or regulations of any Federal, State or local agency with respect to generation, sale or transmission of electric power produced through use of nuclear facilities."

57. True, the NRC has the authority under §182 of the Atomic Energy Act to decide whether the applicant has "financial qualifications" which it "deems appropriate for the license." But this authority must be read with, and is limited by, §271 in which the states and FERC clearly retain their ratemaking authority. Thus, the NRC cannot use §182 to impose a specific funding method for decommissioning because to do so would result in an indirect repeal of §271.

58. Even assuming arguendo that the NRC has jurisdiction to specify a funding method for decommissioning, we find that Applicants' proposed unfunded negative net salvage method is reasonable. Under the method, ratepayers who are currently using the facility will pay their share of the decommissioning cost, while future ratepayers (those taking service after the facility is decommissioned) will not be burdened. In addition, the unfunded reserve will provide Applicants with improved cash flow, thus reducing their need to borrow at today's high capital costs for their construction programs. While a funded method may provide greater assurance than the unfunded method, the evidence here does not require that added assurance. We agree with Staff that in view of the rate regulation to which SCE&G is subject, there is no reason to believe that the funded approach would provide any greater assurance. The concerns raised during the hearing regarding the tax treatment for decommissioning, whether bondable property would be available for decommissioning and whether use of such property puts an unfair burden on future ratepayers, are unfounded.

59. Finally, we do not read § 50.33(f) and Appendix C as requiring an applicant to show the financial ability to prematurely decommission the facility or withstand a TMI-2 type accident. The term "permanent shutdown" in these regulations means decommissioning at the end of the facility's normal life. If the NRC intended to include premature decommissioning as a requirement, it would have explicitly so stated,

but it has not. Further, nowhere in § 50.33(f) and Appendix C is there any reference (even remotely) to requiring applicants to show financial ability to withstand an accident; the word accident is not even mentioned. Confirming this interpretation is the history of these regulations and the relatively modest implementing requirements of Appendix C which provide that an applicant's annual financial statements are usually sufficient to show reasonable assurance.

60. In any event, we find that Applicants are stronger financially than GPU was at the time of the TMI-2 accident. Of course, GPU is still in business and safely maintaining the crippled facility. Were it appropriate to do so, we would find that Applicants have a variety of possible options available to raise the necessary funds to either prematurely decommission the facility or withstand a TMI-2 accident. These include, but are not limited to rate relief, insurance, access to the capital markets, use of internally generated funds and federal, state and industry aid.

Board Issue of Management Attitude

(a) "The Board is obligated to satisfy itself that the bringing in of a co-owner or co-applicant does not in any sense compromise the responsibility that South Carolina Electric and Gas will be taking with respect to completion of construction and proper operation of the facility." (Tr. 321).

(b) "[T]he Board is also very sensitive to the fact that this is the first nuclear plant that South Carolina Electric and Gas is building and is requesting a license to operate. That being the case, it is especially important to the Board that we develop on the record a feeling for management attitudes within the applicant's organization with respect to completing and operating this facility." (Tr. 322).

a. Co-ownership

61. With respect to the first area of concern relative to management attitude, Applicants presented a panel of two witnesses, Thomas C. Nichols, Jr., Vice President and Group Executive, Nuclear Operations for South Carolina Electric & Gas Company, and Mr. Henry Cyrus, Senior Vice President, Engineering, South Carolina Public Service Authority. Mr. Nichols stated that he is the designated officer of SCE&G in charge of all activities associated with operation of the Virgil C. Summer Nuclear Station. (Testimony of Thomas C. Nichols, Jr. following his statement of professional qualifications which follow Tr. 2846, at p. 1). Mr. Cyrus is in charge of planning for SCPSA (Tr. 2847). No other party presented evidence on this issue.

62. There was no prefiled testimony specifically on this first area of concern. Applicants did ,however introduce the Joint

Ownership Agreement between SCE&G and SCPSA dated October 19, 1973 and Amendment No. 1 to Joint Ownership Agreement dated June 1, 1976 together as Applicants' Exhibit 20. (Tr. 2872). 26/

63. The underlying concern of the Board regarding the relationship between SCPSA and SCE&G was that the lack of a well-enough defined relationship relative to the facility could give rise to disruptive disagreements on construction and operating issues to the detriment of the safety and welfare of the public.

64. The Joint Ownership Agreement itself provides in section 2.07 the basic answer to the Board's concern:

> "In order to provide unified management of the Project [V.C. Summer Nuclear Station, Unit No. 1 licensing, construction and operation], Authority [SCPSA] authorizes and designates Company [SCE&G], and Company agrees to so act, as its agent to design, construct, operate and maintain the Project under the terms of this Agreement, and the Parties [SCPSA and SCE&G] agree that Company shall have sole possession and control of the Project for the Parties subject to the provisions of Paragraph 2.06 [right of entry], and shall have sole authority for the licensing, decommissioning, design, construction, operation and maintenance of the Project in accordance with Prudent Utility

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26/ Applicants had already provided copies to the Board and parties pursuant to a letter of transmittal from Applicants' counsel dated December 5, 1980 as per the Board's request. (Tr. 2849, 322). That letter described the agreement in these words: "[t]his is of course a desirable arrangement from the standpoint of NRC licensing and regulation, in that there is no division of responsibility for decisions affecting the public health and safety nor any division in accountability to the NRC." The witnesses subscribed to that characterization. (Tr. 2849).

> Practice [defined in Paragraph 1.20] and in such manner as is required in the reasonable judgment of Company to obtain the approval of or comply with the requirements of regulatory agencies having jurisdiction." (Applicants' Exhibit 20, pp. 9-10).

65. There is a provision in the Joint Ownership Agreement for resolution of disagreements (Paragraph 4) which calls for appointment of a Project Consultant to settle the disagreement. It was heartening to the Board to hear from Messrs. Nichols and Cyrus that since the signing of that agreement in 1973, there has been no need to appoint a Project Consultant. (Tr. 2853-54).

66. In the event a situation arises calling for the appointment of a Project Consultant, the Agreement contains provisions giving SCE&G the right to proceed with matters disapproved by the Authority subject to subsequent Project Consultant determination and possible financial or other adjustment (Paragraph 4.04), particularly where in the Company's judgment the failure to take immediate action would jeopardize conformance with regulatory requirements or would create an immediate danger to the safe operation of the Project (Paragraph 4.05).

67. Although the Applicants have rather different ownership structures, they do not think these differences will cause any disagreement as to what constitutes "prudent utility practice." (Tr. 2855). No such differing interpretation of that term has arisen to date. (Tr. 2855). Also, to date no difficulties have arisen between the two utilities because of a lack of communication regarding construction costs. (Tr. 2857).

68. Applicants were not brought together for the first time by the decision jointly to own and operate the facility. Both Mr. Nichols and Mr. Cyrus testified that SCPSA and SCE&G have operated in parallel electrically for many years. (Tr. 2863). There already are operating agreements between them. There are tie lines between the utilities; their dispatchers discuss loadings on the units and the tie lines every hour; meters are read every hour; and information is exchanged between the two utilities. (Tr. 2863).

69. Even though the construction of the Summer plant has undergone delays since the original concept and the cost of the plant has increased, neither witness expressed any dissatisfaction with the agreement as it is structured and as it has operated. (Tr. 2863-64).

70. Based on the above, the Board is satisfied that the co-owner relationship between SCE&G and SCPSA will not in any sense compromise the responsiblity that SCE&G will be taking with respect to completion of construction and proper operation of the facility. To the contrary, we conclude that there is a sufficiently defined relationship relative to the facility to minimize possible disagreements on construction and operating issues and to assure orderly resolution of any that may arise in the future without detriment to the safety and the welfare of the public.

b. Management Attitudes

71. Addressing the second area of concern relative to management attitudes within SCE&G's organization regarding completing and operating the facility, Applicants presented

a panel of five witnesses including Mr. Nichols, Mr. Dan A. Nauman, Group Manager, Nuclear Services for SCE&G, Mark B. Whitaker, Jr., Group Manager, Nuclear Engineering and Licensing, SCE&G, William A. Williams, Jr., General Manager, Nuclear Operations, SCE&G, and O. S. Bradham, Manager of V.C. Summer Nuclear Station, SCE&G (Nichols Panel). On this issue, Applicants offered, and we received, the pre-filed testimony of Mr. Nichols and nine exhibits into evidence. (Applicants' Exhibits 21-29, Tr. 2921). No other witnesses and no other exhibits were offered or admitted on this issue except, of course, the FSAR and SER. 27/ The other parties did, however, cross-examine Applicants' witnesses.

72. Mr. Nichols stated his company's recognition that effective management to assure safe operations begins at the highest corporate level. Within his company, the ultimate responsibility for safety and quality in nuclear operations lies within the nuclear operations department, which has overall responsibility for the facility and for which he, as Vice President, Group Executive, Nuclear Operations, is directly responsible. (Nichols Testimony, p. 6). Nichols testifed that he has been delegated the authority needed to carry out those responsibilities and has received and is receiving the full support of the President and CEO and the Executive Vice President of Operations. (Nichols Testimony, p. 6).

27/ For example, Sections 13 and 22 of the SER (Staff's Exhibit 1(b)) also relates to management review. The content of the SER relative to management is consistent with Applicant's testimony and reveals that Staff concerns have been satisfied.

73. The philosophy of SCE&G regarding safety as enunciated by Mr. Nichols is that "Management's responsibility is to foster attitudes about safety and effectiveness in operations and to implement controls that minimize or prevent problems from occuring." (Nichols Testimony, p. 7) According to Nichols, "Safety is not the antonym of productivity. Safety and productivity are complementary." (Nichols Testimony, p. 7).

74. Nichols' pre-filed testimony as admitted gave the Board a detailed description of SCE&G's Nuclear Operations Department with lines of authority, areas of responsiblity, inter- and intra-functional relationships and descriptions of management control mechanisms. There was also rather extensive discussion of manpower resources and managerial and technical capabilities.

75. The Nuclear Operations Department has three primary functional groups or divisions -- Nuclear Operations, Nuclear Engineering and Licensing, and Nuclear Services. (Nichols Testimony, p. 9)(See figure 22-1, SER Supp. No. 1, 22-12).

76. Nuclear Operations is responsible for training of licensed and non-licensed personnel, implementation of station security, fire and emergency plans, and implementation of applicable portions of SCE&G's quality assurance program. Nuclear Operations is also to supply on-site engineering support for plant modification and maintenance as well as being responsible for the compilation of plant performance statistics and maintenance of required operating and maintenance records. (Nichols Testimony, pp. 9-10).

77. The general functions of Nuclear Engineering and Licensing are the management of engineering and design activities which support the facility and the management of regulatory interface to assure safe operation at the facility. (Nichols Testimony, p. 10). Specific engineering support functions of this department include providing in-house project management and control for major maintenance and modification activities, development and review of design changes and performance of analyses supporting such design changes, evaluation of off-normal occurrences and significant operating experience reported by other utilities, and development and implementation of corporate policy and programs relative to radiological and environmental safety. (Nichols Testimony, pp. 10-11).

78. Within the Nuclear Engineering and Licensing Department, an independent safety engineering group (ISEG), consisting of engineers located at the Summer Station, functions to provide a technical review of all areas of plant activity to the corporate office outside the plant operating organization. (Nichols Testimony, p. 11 and SER Supp. No. 1, §22 (Item I.B.1.2) pp. 22-14, 22-15).

79. The third major functional department is Nuclear Services which has general responsibility for quality assurance and nuclear fuel services. Quality assurance functions include development, implementation and continuing evaluation of programs which assure that safety-related structures or components will perform satisfactorily in service and the identification of quality-related problems with concommitant

communication of these problems to management and subsequent monitoring of corrective action to assure proper resolution. (Nichols Testimony, p. 12). Nuclear fuel service functions include technical and economic review responsibilities as well as evaluation and management of contracts with vendors of core design changes. (Nichols Testimony p. 13)

80. Certain review groups also function to review and evaluate plant actions, occurences, and policies with safety implications. The purpose is to provide perspective independent from that of line organizations or that of any individuals responsible for areas subject to review group evaluation. (Nichols Testimony, p. 14). These review groups include the Nuclear Safety Review Committee (NSRC) and the Plant Safety Review Committee (PSRC).

81. The NSRC reports to the Vice President, Group Executive for Nuclear Operations to give him technical advice on matters associated with nuclear safety; the PSRC reports to the Station Manager. (Nichols Testimony, pp. 14-17).

82. In addition to the independent review groups, shift technical advisors (STA's) provide an additional pool of technically trained personnel to assist during normal and emergency operating conditions. They provide direct technical assistance to the Shift Supervisors. (Nichols Testimony, pp. 17-18).

83. Mr. Nichols described a number of procedural controls established to govern the daily functioning of the Nuclear Operations Department. The specific illustration given by Mr. Nichols in his testimony was a discussion of the means

by which design changes and Licensee Event Report (LER) reviews are accomplished within the Nuclear Operations Department.

84. Mr. Nichols described and discussed outside sources of technical information available as complements to Applicants' own internal technical resources: LER's, membership in INPO (Institute of Nuclear Power Operations), NSAC (Nuclear Safety Analysis Center), and the NSSS supplier (Westinghouse). (Nichols Testimony, pp. 23-25). Mr. Nichols also mentioned SCE&G's use of "Notepad," an industry hot-line used for disseminating information and which serves as a mechanism for quick communication with other utilities. Its value, according to Mr. Nichols, is as an advance information source rather than as a primary source of information. (Nichols Testimony, pp. 25-26).

85. SCE&G is supplementing its staff technical capabilities through arrangements with Westinghouse (the NSSS supplier) and Gilbert Commonwealth Engineering and Consultants (the architect/ engineer for the facility). (Nichols Testimony, pp. 26-28).

86. Mr. Nichols' testimony included a discussion of the Shift Supervisors' responsibilities, the significant point being that it is the Shift Supervisor who is the individual making immediate safety decisions at all times and who is in functional charge of the facility during backshifts and weekend periods. (Nichols Testimony, p. 29). Also of significance is Mr. Nichols' testimony that:

> "[N]o person or organization is authorized to direct the Shift Supervisor to take any action which the Shift Supervisor considers contrary to the safety of the facility, facility personnel or to the general public." (Nichols Testimony, p. 30).

87. Mr. Nichols gave testimony concerning the company's continuing efforts to recruit experienced and qualified personnel to bring the corporate organization up to authorized strength. It appears that SCE&G is meeting with good success in that effort.

88. By way of cross examination, Intervenor attempted to challenge the qualifications of Applicants' Plant Manager, Mr. O.S. Bradham on the basis that he lacks a bachelor's degree. Mr. Nichols responded that he had the utmost confidence in Mr. Bradham's ability to manage the plant and the lack of a Bachelor's degree on the part of Mr. Bradham poses no problem. (Tr. 2925). There is of course no current requirement in the regulations that station managers possess a bachelor's degree.

89. Indeed, In Mr. Bradham's recitation of his professional qualifications, he gave a long history of involvement in the nuclear industry beginning with employment by DuPont at the Savannah River plant where he worked on production reactors (Tr. 2899); the Carolinas Virginia Tube Reactor where he worked as an instrument technician and instrument electrical supervisor (Tr. 2900-2901); Duke Power Company's Oconee Nuclear Station where he was employed as Instrument Engineer and later Technical Support Superintendent, in which position he was responsible for the pre-operational test program on Unit 3 and had total responsibility for reactor physics performance of Units 1 and 2, and

finally Superintendent of Maintenance at Oconee with responsibility for all three units and where he reported directly to the Plant Manager or Plant Superintendent and, on frequent occasions, filled in as Station Manager for all three units. (Tr. 2901-2903). We find that Mr. Bradham's technical qualifications for his position based on his extensive relevant experience are surely adequate.

90. In response to Intervenor questioning regarding the number of Senior Reactor Operators (SRO's) at the facility, Applicants responded that while at the present time none of the operators have been licensed or certified by the NRC, there are at the plant several individuals who have received previous licenses; at least one member of the ISEG has received a license at a plant similar to the Summer unit; a control room foreman has received a license at a facility similar to Summer; the operations supervisor has received a license at a large nuclear facility; and the Assistant Plant Manager has received a license at a large nuclear facility. (Tr. 2911-2912). In addition, another individual who possesses a Reactor Operator (RO) license at a large operating reactor will be joining the company in September. In the quality assurance organization, there are some six individuals who have had SRO credentials or previous Naval operating experience. (Tr. 2912). In addition, not included in these referenced personnel are six SRO qualified individuals who are contract, non-permanent employees, who have been on the job for about a year and will remain on the job on shift duty in the control room up to and including full load of the unit. (Tr. 2913-2914).

91. In further explanation of the function of the contract SRO's, Nichols testified that they are observers of the operation of the unit, not operators. Their function is to be available during the time it takes SCE&G's permanent personnel to receive hands-on experience, and although these contract personnel are anticipated to be on-site only through full load of the plant, they may be extended beyond that period. (Tr. 2922-23).

92. In response to Intervenor questioning concerning his lack of operating nuclear plant experience, Mr. Nichols stated that, with the technical assistance he will receive from qualified personnel, he can fulfill the requirements of the management position. (Tr. 2926-2927). In his professional qualifications (following Tr. 2846) it appears that Mr. Nichols has had nearly thirty years experience in the electric utility industry (all with SCE&G) during which times he has held a variety of engineering and management positions. He holds a Masters degree in Business Administration. He is a registered professional engineer in the State of South Carolina, a member of a number of professional societies and organizations and industry-related organizations, and holds or has held positions of authority in those organizations. He has had up to nine hundred individuals under his supervision and control at one time and has had responsibility for the operation and maintenance of the entire generating capability of SCE&G's generating system.

93. Mr. Nichols' management responsibility for nuclear

operations began in 1977 when he assumed the position of Vice President and Group Executive, Power Production and Systems Operations. The concentration of his responsibility solely on nuclear operations occurred in July, 1980, when he was appointed Vice President and Group Executive, Nuclear Operations, the position he currently holds. (Id.)

94. Mr. Nichols testifed that he is doing a number of things to familiarize himself with the Summer facility, its operations and its personnel: he spends at least one day a week at the plant familiarizing himself with the check-out and start-up of the facilities; he attends weekly meetings with the engineering and construction management groups along with quality assurance people; and he has been making unannounced visits to the plant and control room, sitting down with the Shift Supervisors to discuss such matters as training and their relationship with the Shift Technical Advisors. Nichols says he is attempting to get personally familiar with the plant and its personnel, and to get a good feel for what is going on at the plant. (Tr. 2970-2971).

95. In response to an Intervenor question as to whether Applicants' Health Physics Staff contains anyone having hands-on experience in an operating plant, Mr. Bradham responded that the current Health Physics Supervisor at the plant has had four years of large nuclear power plant experience in the health physics position and approximately forty-five (45) percent of the other health physics technicians have previous operating plant experience. (Tr. 2931). In addition, those hired from the Navy program who do not possess actual power experience have been sent to other operating nuclear plants to support outages

so that all of the plant's health physics people have had operating power plant experience or are gaining that experience. (Tr. 2931-32).

96. The Board inquired whether Applicants were aware of any requirements that the NRC has placed upon it with regard to upgrading qualifications that have not as yet been met or are in the process of being met. Nichols responded: "We have satisfied their concerns." (Tr. 2934).

97. Questioned as to what extent Applicants might see safety considerations perhaps getting in the way of profitability, Nichols testified as follows:

> "I do not see safety getting in the way of profit ability. It has been my experience, . . . in the electrical utility industry over the last twenty years that you cannot have productivity unless you have safety and quality.
>
> "I found that to be true in my steam plants, for example. . . .
>
> "To me, safety and quality in the long run is going to be profitable. In the short run you may think that you may be getting a little profit by sacrificing safety, but in the long run safety is going to be the most profitable. That is my philosophy toward operation of that plant [Summer Station Unit 1]." (Tr. 2946).

98. Nichols testified that representatives of SCE&G recently visited General Public Utility's office at Three Mile Island Nuclear Station to review and gain insight into GPU's organizational structure, controls and management philosophy. (Nichols Testimony, p. 4). They also visited

other nuclear power plants including a relatively small utility with one operating nuclear unit to make a similar review. (Nichols Testimony, p. 4).

99. Mr. Nichols had reviewed the report of the President's Commission on the accident at Three Mile Island and the Rogovin special inquiry group's report. (Nichols Testimony, p. 4).

100. When asked by the Board what Applicants had learned, particularly about Three Mile Island and the mistakes that may have been made there, through these visits and this reading, Mr. Nichols opined that (prior to the accident) there was an apparent lack of management attention and involvement in the on-going affairs of the Three Mile Island plant, and communications within the nuclear industry at large were not finding their way into plant procedures. (Tr. 2950). To counter this, SCE&G reviews LER's for applicability to the Summer Plant. Additionally, SCE&G is a part of the "Notepad" communications network which identifies and analyzes significant events occurring within the industry. Company management reviews these documents also for applicability to the Summer Station. (Tr. 2950-51).

101. Nichols testified that SCE&G was going to instill in its employees the importance of quality control and quality assurance by training and retraining employees in applicable requirements and through staff meetings and monthly plant safety meetings. (Tr. 2953).

102. Since there is one level of management between Mr. Nichols and the President and CEO of SCE&G, the Board was

concerned whether there might be occasions when that intervening level of management may seek to impose a decision having potential safety implications on the Nuclear Operations Department of the company. Mr. Nichols stated that as far as the routine operations of the nuclear plant are concerned, he is responsible for making decisions which impact on the plant. The intervening level of management would be consulted only in terms of long-range scheduling matters. (Tr. 2963). Additionally, Mr. Nichols testified as follows:

> "Well first of all, I can tell you that the President and Chief Executive Officer of my company has ... told me that safety is the first consideration of that plant and that [he is] looking to [me] to make the decisions to maintain the safety of that plant." (Tr. 2964).

103. If Mr. Nichols and his immediate superior cannot reach agreement on something, Mr. Nichols will go, along with his Supervisor, to the President and Chief Executive Officer to resolve it. (Tr. 2974-75).

104. If safety problems arise within the plant which plant employees feel are not being properly addressed, the plant employees have been instructed by Mr. Nichols to work safety problems out with their Supervisors, but if an employee feels a Supervisor is ignoring a safety issue after it has been called to his attention, that employee is encouraged to contact Mr. Nichols and that he, Mr. Nichols, will see that the problem is investigated. (Tr. 2971-72; see also Applicants' Exhibit 26).

105. Mr. Nichols stated the commitment of SCE&G to the safe operation of the facility as follows:

> "South Carolina Electric and Gas Company is aware of its responsibility to insure the safe operation of Virgil C Summer Nuclear Station and has established an effective management system to accomplish that objective. South Carolina Electric and Gas Company is committed to the effective dispatch of that responsibility. South Carolina Electric and Gas Company has provided, and will continue to provide, the necessary management and technical resources to operate and maintain the Virgil C. Summer Nuclear Station in a manner consistent to assure health and safety of the public. To that end, a system of management awareness and involvement in the critical issues associated with nuclear power and public health and safety is in place and functional ... ." (Nichols Testimony, p. 31).

106. The Board has satisfied itself from the evidence just recited that Applicants have learned valuable lessons from the Three Mile Island experience. Applicants have a comprehensive, functioning, and likely effective nuclear management system. The Board finds that although Applicants are building and planning to operate their first nuclear plant, they display attitudes regarding the construction and operation of the facility which are consistent with the grave responsibilities regarding the public health and safety which accompany entry into the nuclear power industry. Applicants either have or, in a few instances, are well on their way toward acquiring, the necessary level of technical expertise in the operation and the maintenance of the facility. Applicants have adequately addressed the Board's concerns in these areas and have provided a sound basis for an overall conclusion regarding SCE&G's technical and management qualifications.

INTERVENOR CONTENTION A9

"The quality control of the Summer Plant is substantially below NRC standards as evidenced by consistently sub-standard workmanship, in several aspects, during the construction of the plant."

117. The basis of Intervenor's allegation regarding inadequacy of Applicants' quality control and quality assurance programs was that there were allegations by workers or former workers at the facility site that at least some aspects of the construction program were being improperly managed and that, as a result, a number of significant defects exist in systems or areas of the plant. During the course of the discovery phase of these proceedings, Applicants took depositions of a number of these workers or former workers, including Mr. Stanley Oscar Fort and Mr. Curtis Whisennant. Because Intervenor was unable to secure the attendance of these two individuals at the hearings, their depositions were admitted without objection as Intervenor Exhibits 2 (Whisennant) and 3 (Fort). (Tr. 1437). At the further request of Intervenor, the investigation of the allegations by a Mr. Clarence Crider, as contained in NRC Region II Inspection and Enforcement Division Report 50-395/79-35 (Report 79-35), was admitted as Intervenor Exhibit 1. (Tr. 1437). Intervenor presented no further evidence or testimony on this contention, but did cross-examine Applicants' panel.

118. Applicants presented a panel composed of E. H. Crews, Jr., Vice President and Group Executive, Engineering and Construction, SCE&G; Dan A. Nauman, Group Manager of Nuclear Services,

Nuclear Operations Department, SCE&G, and James M. Woods, III, Manager, Quality Control, V.C. Summer Nuclear Station. We note that Mr. Nauman's testimony consisted of some sixty-three pages of discussion of SCE&G's QA programs and very detailed point by point answers to each allegation raised in the depositions of Messrs. Whisennant and Fort, as well as in Report 79-35. Applicants' Exhibits 6, 7, 8, 9A, 9B, 9C and 10A, 10B and 10C were also received in evidence. (Tr. 1424).

119. In addition to the information contained in Section 17 of the SER and its supplements (Staff Exhibit 1, 1(a), 1(b)), the NRC Staff presented a panel of seven individuals to testify on the subject of Applicant's quality control and quality assurance programs. These individuals were Mr. Virgil L. Brownlee, Project Inspector, Region II, Office of Inspection and Enforcement, NRC; Edward H. Girard, Reactor Inspector, Region II, Office of Inspection and Enforcement, NRC; John L. Skolds, Summer Station Resident Inspector, Region II, Office of Inspection and Enforcement, NRC; Bruce Cochran, Reactor Inspector, Region II, Inspection and Enforcement, NRC; Charles Murphy, Chief of the Engineering Inspection Branch, Region II, Office of Inspection and Enforcement, NRC; William Ang, Performance Appraisal Branch, Region II, Office of Inspection and Enforcement, NRC; and Joseph Lenahan, Region II, Office of Inspection and Enforcement, NRC. The NRC staff pre-filed testimony sponsored specifically by Messrs. Brownlee, Girard and Skolds was received in evidence. (Tr. 2814).

120. The Applicants' testimony 28/ begins with the discussion by Mr. Crews of SCE&G's voluntary commitment to 10 C.F.R. Part 50 of Appendix B, Quality Assurance Requirements. He testified that having investigated the concept of quality assurance ("QA") and understanding the need for it, SCE&G committed to a QA program even before QA program requirements were specified by the NRC. (Crews Testimony, p. 2).

121. To insulate QA from the pressures of construction, cost and schedule responsibilities, SCE&G established QA in a routine requiring the QA organization to report to a company officer not charged with construction cost or schedule responsibilities. (Crews Testimony, p. 2)

122. A quality control (QC) program, as distinguished from a quality assurance program, was established as an inspection arm for field work to insure care in proper installation of equipment and built-in-place structures and systems. (Crews Testimony, p. 3). To remove the QC manager from direct involvement with on-site construction pressures, it was arranged for him to report off-site to SCE&G's Manager of Construction. (Crews Testimony, p. 3). To help insure that systematic quality

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28/ Statements of professional qualifications and pre-filed testimony as admitted into the record for Applicants' panel begins following p. 1386 with the professional qualifications of James M. Woods, III (2 pages), the professional qualifications of Dan A. Nauman (4 pages), the testimony of Dan A. Nauman (63 pages) errata for Mr. Nauman's testimony (1 page), professional qualifications for E.H. Crews (2 pages), and testimony of E.H. Crews (9 pages).

problems or breakdowns in quality were not allowed to continue after detection, several persons were vested with the authority to stop work not being properly performed. Stop-work authority was vested in at least three individuals: the Site Manager, the QA Manager, and the QC Manager. Such authority allowed any of these individuals absolutely to hold up any activity that, in his or their opinions, was not under proper control at any point in time. (Crews Testimony, p. 4).

123. One factor which Mr. Crews identified as giving rise to some quality control difficulties was SCE&G's inability to secure "N" Stamp approval for American Society of Mechanical Engineers (ASME) Code Group work at the site. This resulted in these "N" stamp activities being the responsibility under the code, not of SCE&G's QC program, but that of its constructor. However, code work remained subject to SCE&G's QA overview. Later, however, it became necessary for SCE&G to oversee the constructor's QC activities in the code work area:

> "Because of later noted deficiencies in the performance of our contractor's QC program, we lost confidence in the results of their program. In order to satisfy ourselves that the QC function was being properly carried out, we subsequently initiated a program of parallel inspection by SCE&G QC of all constructor QC inspections." (Crews Testimony, pp. 4-5).

124. Mr. Crews cited the statistic that during the eight year construction period thus far, more than 12,000 craft employees have been involved on the project, but nevertheless SCE&G insisted that the constructor, from home office personnel down through apprentice craftsmen be indoctrinated, trained and supervised with quality commitment. (Crews Testimony, p. 5). (See also Applicants' Exhibits 7 and 8).

125. As indicia of an overall quality control effort, Mr. Crews testified that: SCE&G fully participates in a quarterly quality review meeting conducted by the constructor involving both home office and site personnel; a field review board was established to review performance, analyze trend and recommend corrective actions, which meets monthly; all new employees are required to attend an indoctrination program to stress the importance of quality in workmanship; and various meetings with craft employees are conducted in an effort to communicate a commitment to quality. (Crews Testimony, p. 5) (see also Applicants' Exhibit 26).

126. Mr. Crews testified that over 3,000 welders have been involved in training courses established by SCE&G as part of an effort to assure quality work. (Crews Testimony, p. 6).

127. Mr. Crews gave examples of what SCE&G did in an effort to minimize errors resulting from the human element over a long construction period:

> "Therefore, in pursuit of our commitment to Quality, we bought material for even non-safety related installations to meet specifications for safety related installations. Some examples of this are sand, additives, cement and coarse aggregates. These all were bought to meet safety related criteria. All rebar was bought to meet safety related specifications. All power and control cable were bought safety related. All welding rods were bought to meet safety related specifications. Our intent was to remove the chance that a craftsman using one of these materials in a safety related area might by mistake use materials that had not been purchased safety related. We did the same thing with grout. In our minds, pipe hangers were very important to the project, and to design, and to safety in general. Even where not required, we committed pipe hangers to be installed to the new "NF" section of the ASME Code. Any deviations from drawings or specifications and the corrections needed were required to be documented. I

discussed earlier this documentation. The closing of all these loops has been assigned to our QC section. I believe these things bespeak of a dedication to quality and safety." (Crews Testimony, pp. 7-8).

128. Mr. Crews admitted that SCE&G's programs for quality control and quality analysis have not been perfect and that while some mistakes were small, some had more significant impacts. He concluded, however, that where mistakes were made, they were corrected and that constructionwise and to the extent humanly possible, the facility meets the NRC safety-related requirements and probably in every case exceeds them. (Crews Testimony, p. 8). We accept that conclusion as well-supported by the evidence just summarized.

129. Mr. Nauman testified that he is confident that the plant is safe and that his confidence is based upon the "defense in depth" approach to safety for the Summer plant, which relies on layer upon layer of quality assurance and engineered safety margins inherent in the plant. (Tr. 1391)

130. As further indicia of the emphasis the company placed upon quality in construction, Applicants submitted as exhibits a welding parameters book which contains actual welding technique sheets used on the job and which contains a definition of quality, making it clear that the welder is the first line of quality (Applicants' Exhibit 7); and the Employee Handbook which each employee is required not only to read but to certify that he has read it. The Employee Handbook contains a provision stating that "Failure to follow written site procedures applicable to nuclear

safety-related work is a justification for termination." (Applicants' Exhibit 8)(Tr. 1404-05).

131. Mr. Nauman further testified that by regulation, SCE&G would not be required to impose an operational quality assurance program until very close to licensing; but, reflective of their commitment to quality, and understanding that there would be a learning curve involved in indoctrinating personnel to the requirements of an operational QA program, SCE&G chose to begin piece by piece to implement that program beginning in 1977. (Tr. 2671).

132. Applicants testified that in order to avail themselves of every opportunity to gain information concerning possible nonconformities, they initiated a so-called QA hotline in 1977 as a part of a confidential information system which would provide any person the opportunity to identify any area where he or she feels there may be a problem. (Tr. 1393).

133. Applicants published and posted a notice in early 1978 concerning the confidential information system providing information to the site workers as to the methods available to bring to the attention of the appropriate authorities any concerns they might have relative to quality. The document contains telephone numbers for various individuals whom the workers may contact and indicates to them that their anonymity would be maintained upon request. A direct phone number to the NRC in Region II, Atlanta was also given. The notice seems to be in line with 10 CFR Part 21. (Applicants' Exhibit 6)(Tr. 1401-1402).

134. Mr. Nauman testified that on thirty-nine occasions, workers have come forward to identify substandard work. (Tr. 1453). However, according to Nauman, workers have largely utilized the in-place nonconformance control system so that for the most part there has been little use of the confidential information system. (Tr. 1454).

135. In response to an Intervenor question whether workers are less than forthcoming with their complaints, Nauman responded that SCE&G will take the information any way that it comes, but that construction workers seem to be concerned with being known as "tattletales" (hence the availability of confidential communications). (Tr. 1454).

136. Mr. Nauman testified that in his opinion the systems utilized by SCE&G to control quality have properly functioned as indicated by the fact that the system has produced 13,000 nonconformance documents. (Tr. 1392).

137. The Board inquired about the seemingly high number of nonconformance items. At the request of the Board, each of the panel members developed testimony relative to SCE&G's history of nonconformance and NRC noncompliances relative to time. 29/

138. Mr. Crews described SCE&G's quality control document program which includes Deficiency Notices (DN), Non-conformance

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29/ This testimony is found following Tr. 2672 beginning with Supplemental Testimony of E.H. Crews consisting of two pages, Testimony of J.M. Woods consisting of three pages plus two attached graphs, and Supplemental Testimony of Dan A. Nauman consisting of three pages, a bar chart, a listing of stop-work notices, a summary of NRC items of noncompliance, and another bar chart.

Notices (NCN) for all but Code work, and the NCN-A and NCN-B for Code work. Mr. Crews gave the following explanation of each of these documents:

> "The Deficiency Notice (DN) is the least severe and is defined as a non-conforming situation which can be corrected using existing procedures or by replacing the non-conforming item. DN's may be used to document anything from a broken part to incomplete or lost paperwork. The resolution of DN's normally takes a relatively short period of time.
>
> The Non-conformance Notice (NCN) is used to document all other non-conforming situations that require engineering evaluation and approval for resolution. Examples of NCN's would be cold joints in concrete, base metal defects in steel, improper anchor bolt or Hilti installations. The resolution of the NCN normally takes a longer period of time to allow for engineering analysis and investigation, if necessary.
>
> In the Code Area, the NCN-B would compare to the DN and the NCN-A would compare to the NCN relative to severity of impact." (Crews Supplemental Testimony, pp. 1-2).

139. Having given this description of SCE&G's quality control documentation process, Mr. Crews went on to state that only about 2,200 of the 13,000 non-conforming documents are classified as NCN's. (Crews Supp. Testimony, p. 2).

140. Mr. Nauman provided an explanation of the NRC noncompliance classification program. Under the old NRC system, there were three levels of severity: violation, infraction, and deficiency. Violations were items of major significance, infractions were of lesser significance and deficiencies were of minor significance. The newer NRC classification categories include I-VI. Categories I-III correspond to the old "violation" category and are of major significance. Categories IV and V correspond to the old "infraction" category and are of lesser significance. Category VI corresponds to the old "deficiency" category and is of minor

significance. (Nauman Supp. Testimony, Summary of NRC Items of Noncompliance).

141. Out of 172 NRC inspections since 1971, the NRC has cited SCE&G for no violations, 37 infractions, 13 deficiencies, and 3 deviations (deviations being non-safety related deficiencies). Since the implementation of the newer categorization system, the NRC has cited SCE&G for one Level VI violation and 3 Level V violations and none of any greater significance 30/ (Nauman Supp. Testimony, Summary of NRC Items of Non-Compliance).

142. Asked by Intervenor to put these 13,000 documents into some kind of perspective in comparing them to another nuclear facility, Nauman testified that in general SCE&G comes out better in the overall numbers than some of the other plants. (Tr. 2673) (see also Nauman Supp. Testimony).

143. As regards the allegations of Stanley Oscar Fort contained in his deposition as admitted as Intervenor Exhibit 3, it is most significant to the Board that Mr. Fort, who was only employed at the site as a welder from April 17, 1978 to June 7, 1978, never performed any safety-related welding at the Summer Station. (Nauman Testimony, p. 15; Staff Testimony on Contention A-9, Attachment C, p. c-3). Beyond that, each

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30/ There appear to be minor discrepancies between Applicants' figures for number of inspections and noncompliance items and those presented by Staff at p. 5 of its prefiled testimony on Contention 9. However, the discrepancies, which are not large, may be due in part to an apparent difference in time periods for which the numbers were given. Applicants' numbers are higher.

allegation made by Mr. Fort in his deposition was categorically and specifically addressed and refuted by Mr. Nauman. (Nauman Testimony, pp. 15-21). The Staff likewise addressed and dispositioned the allegations. (Staff Testimony on Contention A-9, Attachment C).

144. Regarding Mr. Fort's allegations, particularly that heavy wall carbon steel piping in his work area was being welded with-out proper pre-heat, that there was a problem with the use of bad E-7018 electrodes, and that welding performance qualification was improperly accomplished because welders could move their qualification test assemblies during welding, the Staff's investigations determined that Mr. Fort did not weld any safety-related pipe and that inspections produced no items of non-compliance or deviations (Staff Testimony on Contention A9, Attachment C, pp. C-3 and C-5); that Mr. Fort apparently confused or mistook difference in colors between two brands of E-70A18 electrodes as being indicative of a mixture of good and bad electrodes but testing revealed that the electrodes, although differing in brands and color, were acceptable in welding characteristics (Staff Testimony on Contention A9, Attachment C, p. C-6); and test assemblies could not be moved out of position; and no items of non-compliance or deviations were identified by the Staff in its inspections (Staff Testimony on Contention A9, Attachment C, p. C-8). These conclusions are consistent with Applicants' findings as well. We are satisfied with the resolution of the matters raised by Mr. Fort based upon the evidence of Applicants and Staff.

145. Of primary significance to the Board, as regards the allegations of Curtis Whisennant concerning alleged welding deficiencies at the Summer Station, as contained in his deposition admitted as Intervenor Exhibit 2, is the fact that Mr. Whisennant was only employed at the V.C. Summer Nuclear Station from the period June 7, 1976 to October 30, 1976, during which time no significant ASME Code welding was performed. (Nauman Testimony, pp. 25-26). Also, Mr. Whisennant's position was administrative in nature; he was not qualified actually to perform welding and he performed no welding during his five months of employment. (Nauman Testimony p. 26). Beyond that, Mr. Nauman's testimony addressed in detail, and to the satisfaction of the Board, each allegation made by Mr. Whisennant in his deposition. (Nauman Testimony, pp. 22-26).

146. Staff's testimony regarding Mr. Whisennant's allegations concentrated on his allegation concerning a problem existing with repeated repairs to a certain weld. (Staff Testimony on Contention A[illegible]n. 9). Staff concluded that although several repairs were required, the records of the Applicants appear to be in order and indicate nothing implying that the acceptability of the finished weld should be questioned. (Staff Testimony on Contention 9, Attachment C, p. C-3).

147. Albeit the allegations of Messrs. Fort and Whisennant concerning problems in welding at the Summer Site proved to be insignificant in and of themselves, other testimony and exhibits on the subject of welding at the Summer Site, particularly with regard to safety-related systems, indicated

clearly that welding was the area of preeminent difficulty in regards to Applicants QA and QC responsibilities in this project.

148. Allegations of a Mr. Clarence Crider, a former welder with Applicants' constructor, Daniel Construction Company, gave rise to an NRC I&E investigation which resulted in I&E Investigation Report No. 50-395/79-35 (Intervenor Exhibit No. 1).

149. Although Mr. Crider first approached the Applicants, he would not provide specifics. According to Applicants, the first contact occurred on May 29, 1979 when Mr. Crider approached SCE&G QA personnel, making allegations of inadequate work in general areas of welding and indicating that work was not been properly conducted in the stainless steel fabrication shop. (Nauman Testimony, p. 27). At the same time he indicated concerns in the area of Applicants' constructor's quality control inspection, weld fit-ups, shop supervision, weld-packets and problems in one inch and 3/4 inch line requiring welding. (Id.) According to Applicants, however, Mr. Crider's willingness to discuss the particulars of his allegations was hinged upon some promise of personal gain or benefit to Mr. Crider. (Nauman testimony, p. 27).

150. In addition to the May 29 meeting, Applicants indicated that Mr. Crider contacted Applicants' representatives by phone or in person on several other occasions -- June 14, 1979 (Nauman Testimony, p. 28), June 19, 1979 (Nauman Testimony p. 30), July 11, 1979 (Nauman Testimony, p. 32),

and June 21, 1980 (Nauman Testimony, p. 62). All of the meetings had generally the same outcome, i.e. Mr. Crider would provide general information but not information specific enough to allow a follow-up investigation by Applicants' QA or QC personnel. Although in a July 11, 1979 phone call Mr. Crider indicated he would provide Applicants with a list of specific welding problems, no such list was ever produced. (Nauman Testimony, p. 33).

151. Unsuccessful in obtaining specifics to investigate, Applicants enlisted the offices of NRC. Applicants provided NRC Region II Office of Inspection and Enforcement the general information provided by Mr. Crider to them on at least two occasions. (Nauman Testimony, pp. 28 and 31).

152. On September 10, 1979 the NRC Region II Office of Inspection and Enforcement initiated an investigation based upon Mr. Crider's allegations. That investigation continued until December 19, 1979 and resulted in Report No. 79-35. (Intervenor Exhibit 1). Report No. 79-35 listed 15 particularized allegations which we have summarized as follows: 31/

A. QC inspectors were inadequately trained to determine fillet sizes on socket wells and necessary tools, such as fillet weld size gauges, were not available. This resulted in preparation and acceptance of many undersized socket welds.

31/ The alphabetized listing is the same as contained in Report No. 79-35 (see Intervenor Exhibit 1, pp. 1-3) and is used by Applicants in D.A. Nauman's testimony.

B. Carbon steel rotary wire brushes were used for cleaning of stainless steel pipe and welds during preparation, resulting in rusting.

C. Welding inspectors sometimes signed off as having inspected welds before welds were performed.

D. The inspectors were inadequately trained to perform high-low check ups on butt-weld fit-ups and it was common practice when butt-weld fit-up problems with high-low checks were encountered to relieve high areas by grinding away with the result that minimum wall thickness limits were frequently not met.

E. With QC inspector and welding supervisor knowledge, high-low code requirements on some butt welds were intentionally violated on some difficult-to-reach welds.

F. Non-code piping was upgraded to ASME Section III, class I with no evidence of proper testing and documentation.

G. An undersized fitting was installed.

H. Inadequate pipe withdrawal from socket prior to making socket weld.

I. QC inspectors and others used alcohol and drugs on the job.

J. Service water line piping received arc-burn damage while cutting lugs on nearby items.

K. A "CARPENTER 20" stainless steel test sample was

accepted by radiographic examination even though there was cracking in the test weld.

L. Carbon steel plates in the in-core pit liner were improperly installed.

M. Welds on carbon steel plates in the liner of the in-core pit were ultrasonically tested as acceptable although in some instances welds entrapped substantial amounts of slag.

N. Unqualified welders performed welding on the in-core pit liner and one unqualified welder welded stainless steel while uncertified.

O. Welders sometime violated welding requirements (on socket welds) to expedite their work. The welding supervisors condone this practice as a means of expediting work.

153. Report 79-35 contains the observation that in several instances where the alleger provided specific information related to inadequate workmanship, the alleger indicated that this knowledge was based upon the fact that he had personally performed the inadequate work. (Intervenor Exhibit 1, p. 3). Given Applicants' Exhibits 7 and 8, and the attempt to gain some benefit for revealing specifics, we find this somewhat anomalous, to say the least. However, our concern is with the safety of the plant and SCE&G's performance, not the bona fides of a construction worker.

154. NRC Region II Inspection and Enforcement staff members met with Mr. Crider on September 10, 1979. Between the period of October 29 through December of 1979, 33 individuals currently or formerly employed at the site were interviewed by NRC investigators. Additionally, field inspections were performed. (Staff Testimony, p. 18).

155. The following findings were made by the NRC Region II staff (Staff Testimony on Contention A9, pp. 19-21):

ITEM #	FINDING
a.	Allegation confirmed by direct observation. Extensive reinspection and repair was required for correction.
b.	Alleged actions were determined not to have safety significance.
c	Allegation confirmed in interviews with craft. Extensive reinspection and evaluation were provided to assure the adequacy of previously accepted work. Allegation was confirmed to have no safety significance.
d.	Allegation confirmed by examinations, although the conditions produced did not occur at the high-frequency indicated. Engineering evaluation of sampling indicated no repairs would be required.
e.	Not specifically confirmed but related to (d). The engineering evaluation applied to (d) was considered applicable to this item.
f.	One of 16 individuals interviewed confirmed this allegation. It could not be confirmed by direct observation. If correct, the allegation is not considered to be a significant safety concern.
g.	Allegation confirmed by non-destructive examination and documentation review. Measures were established to assure identification and evaluation of this and similar items to determine the need for replacement.
h.	Allegation confirmed by interviews with craft. Also some physical evidence indicates inadequate controls of inspections for some items relative to withdrawal requirements.

Engineering evaluations of radiographic data from a sample of the subject items, design data and historical experience with such welds indicated the condition present would provide no significant safety concern.

i. Allegation confirmed by licensee management and craft. Not considered widespread. No evidence was found to indicate that any safety-related work had been significantly affected.

j. Could not be confirmed or denied. An engineering evaluation, taking into account design data on the subject piping, indicates that the alleged actions would not provide significant safety concern.

k. Based on extensive NRC inspection in this area the alleged action was not considered to provide a significant safety concern.

l. Based on an engineering evaluation of the design, the alleged actions are not considered to have safety significance.

m. Same as 1.

n. Same as 1. (This allegation was confirmed in part, by the licensee from their data).

o. Confirmed in interviews with craft. Engineering evaluation of consequences of alleged actions, including data from examination of sample welds and historical data and information from interviews with craft, indicate the alleged actions would not provide a significant safety concern.

156. Two items of non-compliance directly related to these allegations resulted from this NRC investigation. The first related to allegation A and specified that the Applicants' procedures did not include the fillet weld size requirements stipulated by ASME Section III for socket welding flanges,

and an example weld (SW-4 on ISO. DE-CS-24) examined did not comply with the ASME Section III requirement. The second item of non-compliance related to allegation D and specified that a number of ASME Section III welds had sizes below the specified minimum. Examples were given. (Intervenor Exhibit 1, Appendix A; Staff Testimony on Contention A9, p. 21).

157. We now turn to the evidence on the question whether allegations which were borne out have had any impact on the physical soundness of the plant and its satisfaction of regulatory requirements. The allegation concerning the inadequate weld material on socket welds (Allegation A) was one item of great impact in terms of rework and reinspection. As indicated, this item resulted in two infractions being written during Inspection Report 79-35 (79-35 -01 and 79-35-02). There are about 14,000 socket welds on the job site. (Tr. 1413).

158. Applicants' approach to correction of the problem was to institute a 100% reinspection and rework program. During the inspection, where there was any question whatsoever as to the adequacy of the amount of weld material in a weld, weld metal was added. (Tr. 1417).

159. It was identified, however, by both Applicants and Staff that undersized socket welds seems to be a generic problem not peculiar to the Summer site. (Tr. 1414, 3525). Moreover it was pointed out again both by Applicants' witness and Staff witness that socket welds do not have a history of failure, even those performed under a much looser control program for non-nuclear applications than involved in the nuclear plant work (Tr. 1416, 3525).

160. Another problem identified in the Report 79-35 which resulted in significant reinspection efforts by Applicants was the alleged failure to withdraw piping involved in socket welds the required distance prior to welding (Allegation H). ASME Code Section III (71S73) requires that pipe be withdrawn from the ID face of socket weld fittings approximately 1/16 of an inch before welding. (Intervenor Exhibit 1, p. 16). While Inspection Report 79-35 did include a finding that this allegation "may be correct" (Intervenor Exhibit 1, p. 17), Applicants presented physical evidence for which they submitted photographic exhibits 9A, B, and C for the record illustrating that even in cases where the proper 1/16 of an inch withdrawal is made, the welding process itself can cause the pipe to be sucked back inwards to the bottom of the joint such that radiographic examination as well as physical examination may show what appears to an inadequately withdrawn pipe. In other words, just because line contact is visible in radiographs of sockets, such does not necessarily mean that there is improper withdrawal before welding. Weld shrink in excess of 1/16 of an inch or in excess in what was anticipated when the 1/16 of an inch standard was established can occur. (Tr. 1413).

161. Applicants testified that the piping systems have undergone hydrostatic testing and hot functional testing and have shown no deficiencies. (Tr. 1417, 1418). Applicants further testified that the architect/engineer did in-depth evaluation calculations on a worst case thermal system, i.e., one which will see the greatest thermal transients, and was able to establish

that, because of the safety factor built into his specification of schedule sizes in the piping systems, there would have been no chance for failure in the piping system even given an assumed worst case situation of size (i.e., weld material size) or withdrawals (i.e., 100% contact and failure to withdraw). (Tr. 1416 - 19).

162. With regard to the withdrawal problem on socket welds, Applicants evaluated the significance of that problem in terms of the number of socket welds which may have been affected on the basis of a statistically significant sampling program. (Tr. 1448).

163. A similiar statistical sampling program was conducted with regard to the high-low checks on butt-weld fit-up (Allegation D). In that program, 200 out of approximately 2400 welds were examined by non-destructive examination (ultrasonic inspection and radiographic examination, with some few involving pipe sectioning). (Tr. 1444-45). That sampling effort produced less than 10 that were even potential candidates for rejection. Of those 10, none were determined to have a misalignment problem requiring rejection. (Tr. 1445).

164. As to the allegations concerning improper welding in the incore pit liner, we note simply that the incore pit liner is only a concrete form with no safety significance. (Nauman Testimony, p. 59).

165. With regard to these and all other allegations, the Board is convinced that the allegations have been thoroughly investigated and properly dispositioned. Contention A9 is not borne out. There is a very high degree of assurance that safety-related defects have been identified, investigated, and properly resolved. We have seen no evidence that safety has been compromsed or that any regulation has not been satisfied. We raised the question, however, notwithstanding the physical soundness of the plant, as to how these deficiencies crept into Applicants' construction activities if in fact the QC and QA programs were and are in proper functioning order.

166. As identified by Applicants, the root cause of the problems associated with welding was a failure on the part of the welding craftsmen to perform in accordance with procedures, accompanied by a breakdown in the constructor ASME QC program. (Nauman Testimony, pp. 34-35).

167. Applicants identified a number of corrective actions they took upon recognition of the problem. (Nauman Testimony, pp. 35-36):

> "a. a stop work on all ASME welding was issued and maintained until it was confirmed that procedures were redefined to assure adequacy, and

a reindoctrination program was performed;

"b. reinspection efforts in relation to welding inspection were initially accomplished in a 'double check' method with the constructor's QC organization accepting the welds and additional inspection being required by SCE&G/QC or SCE&G/QA (the SCE&G/QC organization was assigned overall responsibility in an "oversight" function in relation to all inspection being conducted by the constructor's QC);

"c. 'Supervisory Performance Assessment Team' was established to monitor day-to-day activities of the constructor's QC supervision

"d. a prototype/mock-up socket weld testing program to investigate the significance of aspects of socket welding was initiated;

"e. all safety related socket welds on the site were reexamined, reinspected, and if there was any doubt at all, weld metal added;

"f. generic aspects of undersized socket welds were pursued with the off-site nuclear piping fabricator and suppliers of skid mounted equipment. Extensive and on-going discussions with the constructor's headquarters offices ultimately resulted in the issuance of a QA policy directed and distributed to all constructor employees signed by the constructor's President and Chief Operating Officer. In

addition, an extensive reorganization effort was directed toward the constructor's overall quality function on-site which removed any formal ties with construction.

168. It is worth noting here that the root cause of allegations raised by Mr. Crider was being pursued by Applicants on a programmatic basis beginning as early as 1978, nine months before the NRC started its investigation. (Tr.1398). Applicants issued Corrective Action Requests No. 047, 049 and 050 (Applicants' Exhibit Nos. 10A, 10B and 10C) to its constructor in December 1978, February 1979 and March 1979, respectively. These Corrective Action Requests raised the issue of the adequacy of the constructor monitoring of welding. According to Applicants, in their QA program a corrective action request is a fairly significant step. There have been less than 100 issued during the nine years of the project.

169. In addition, the Applicants had already committed in March, 1979 to a step-by-step review of the ASME QC program implementation by the constructor. (Tr.1399).

170. An additional concern of the Board related to the existence within the Applicants' organization of a separate construction QC group as opposed to an operating QC group. The concern is whether this suggests an opportunity for some things to "fall through the crack" or a de facto requirement that many things must be relearned by people. (Tr.2678).

171. Applicants explained that when the construction organization is ready to turn over a system to the operations

organization, there is a joint walk-down. During the course of the walk-down, any items noted by the operational group personnel which need changes are noted, and that portion of the system, if not the entire system, is turned back over to construction for correction before the system is accepted by operations. (Tr.2676).

172. It was also pointed out that operations personnel have been involved heavily all along. The operational quality assurance program was initiated in stages beginning in 1977 so that where the programs could be implemented prior to operations, they would be, as was the case in the area of procurement control. (Tr.2684-85). During any walk-down prior to a system turnover, QA people are involved in the walk-down.

173. Thus Applicants have demonstrated that there has been thought put into the problem of transition from a construction mode to an operational mode. The Board does not believe that there will be major problems caused by this transition such as give rise to any safety concerns.

174. Asked by Intervenor to give assurances that all open items in the FSAR would be closed prior to licensing, the Staff responded that they either would be resolved prior to license issuance or their resolution would be defined in the license through license conditions. (Tr. 3551-52). The resolution of open items is made jointly by the regional offices, the I&E people at headquarters, and also NRR as appropriate. This means that although the Board might approve the issuance of a license,

the Staff may hold up license issuance pending necessary progress in resolving items needed for the activity to be authorized. (Id.).

175. The Staff, as their final conclusion regarding the condition of the as-built facility and the Applicants' quality program, stated the following:

> "Based upon the inspection conducted to date in accordance with the NRC construction inspection program, which included selective examination of procedures and representative records, interviews with craftsmen and site personnel, and in depth observations by the inspectors, there is reasonable assurance that the equipment and materials were procured pursuant to design specifications. V.C. Summer has been constructed and the equipment installed in accordance with FSAR commitments and the plant can be operated safely without danger to the health and safety of the public. The licensee has demonstrated its commitment to QA at the V.C. Summer Nuclear Plant by expanding its involvement in the construction program. This included taking corrective actions on identified deficiencies and by staffing a group of construction engineers and QC inspectors at construction site for the vendor inspection program. (Staff Testimony on contention A9, p.22).

176. This Board accepts an adopts that conclusion as overwhelmingly supported in the record. We have relied upon the comprehensive evidence of Applicants and Staff, as summarized in some detail above, and have found the relevant facts to be as we have summarized them. In particular the allegations of Messrs. Crider, Fort, and Whissenant have been found to be without significance to satisfactory completion or safe operation for the reasons stated in our summary and by the witnesses of Applicants and Staff.

177. Indicative of the performance of this utility as far as plant construction is concerned is the fact that NRC Region II I&E inspectors rated the Summer plant better than average.

This is the conclusion of the NRC's Systematic Analysis of the Licensing Performance (SALP) in which inspectors associated with each of the facilities in a region review the performance of each licensee in their area of expertise for the previous year and provide what statistics there are, such as numbers of noncompliance, repetition of noncompliance, the numbers of nonconformances, the number of 50.55(e) reports, etc. (Tr.3567).

178. Region II Office of Inspection and Enforcement has no concerns about the safety of the V.C. Summer Nuclear Plant. (Tr.3572).

179. Based on the uncontroverted testimony of both Applicants and Staff, the Board concludes that the V.C. Summer Nuclear Station, Unit 1 quality control and quality assurance programs for both the design and construction phase and the operation phase have been and are in compliance with the requirements of 10 CFR 50, Appendix B and implementation of both programs has been and is likely to be acceptable.

BOARD QUESTION ON HYDROLOGICAL INTERACTION BETWEEN THE SUMMER FACILITY AND THE FAIRFIELD PUMPED STORAGE FACILITY

> The interaction hydrologically between the Summer Facility and the Fairfield Pumped Storage Facility is a matter that. . .the Board does not feel it fully understands from the documents that have been provided to date. (Third Prehearing Conference, Tr. 323).

180. The Board's request to the Applicants that they present testimony on the subject of the hydrological

interaction between the Summer Facility and Fairfield Pumped Storage Facility was not so much an expression of concern as it was a request for clarifying information on what that relationship is. Although the testimony on direct and the cross-examinations produced interesting and useful information, no safety significant concerns (and none requiring correction of the FES) were generated by that discourse. 32/

181. The Applicants initially presented their witness, Mark B. Whitaker, Jr., Group Manager, Nuclear Engineering and Licensing for SCE&G, as their witness on this subject. Mr. Whitaker was offered as a "fact" witness based upon his personal familiarity with the physical arrangements and interactions between the Fairfield Pumped Storage Facility and the V.C. Summer Nuclear Station as well as his familiarity with those portions of Applicants' FSAR (Applicants' Exhibit No. 5, Tr. 1233-34) which addressed the configuration, design and criteria for the seismic Category I service water impoundment, plant intakes and other similar structures.

182. Questions by the Board and by the other parties required the empaneling of two additional individuals, Mr. W.E. Moore (Tr. 1292), Manager of Hydro and Environmental Engineering for SCE&G and Mr. Frank Waller (Tr. 1321, Professional Qualifications Tr.1325), principal engineer with Woodward-Clyde Consultants.

32/ This discussion is distinct from the matter raised in the context of seismicity of questions as to the feasibility and desirability of lowering Monticello Reservoir to observe any RIS phenomena.

Mr. Whitaker sponsored prefiled testimony 33/ which was offered and received into evidence. (Tr. 1269). No Staff or Intervenor evidence was offered or received on the hydrological matter discussed here, as distinct from the matter last noted in the margin, except of course the SER and FES, which discuss hydrological matters in § 2.4 (SER) and § 4.3 (FES).

183. The Summer station is located on a hilltop adjacent to the Monticello Reservoir, which is the upper pool of the Fairfield Pumped Storage Project and the source of cooling and make-up water for Summer, at an average elevation of 435.0 feet. (Whitaker Testimony, p. 2). The normal maximum water surface elevation of the Monticello Reservoir is 425.0 feet. (Id.). The reservoir has a surface area of about 6800 acres and a storage volume of about 400,000 acre feet at normal maximum water surface elevation. The maximum daily withdrawal for generating purposes is 29,000 acre feet, lowering the reservoir to an elevation of 420.5 feet and reducing the surface area to approximately 6500 acres. (Id.).

184. The service water pond is a seismic Category I impoundment of about 44 acres constructed adjacent to Monticello Reservoir. The service water pond, designed to withstand a safe shutdown earthquake, is connected to Monticello Reservoir via a 36" diameter pipe running between the circulating water

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33/ His prefiled testimony is found following his statement of professional qualifications, which in turn is found after Tr.1269)

intake structure and the service water intake structure. (Whitaker Testimony, p.3).

185. Under a postulated loss of Monticello Reservoir, the volume remaining in the service pond below elevation 415.0 feet, according to Mr. Whitaker, is adequate to insure safe shutdown of the Summer facility and continued cooling for a minimum of 30 days in accordance with Reg. Guide 1.27 (Whitaker Testimony, p.3).

186. The Fairfield Pumped Storage Project is a Federal Energy Regulatory Commission ("FERC") licensed and regulated facility. SCE&G is restricted to a 418.0 feet emergency drawdown elevation. Nevertheless, the nuclear station circulating water intake pumps are designed to operate for Monticello Reservoir elevations of as low as 405.0 feet (Whitaker Testimony, pp.3-4).

187. Responding to a question of whether a drought might affect the reservoir, Mr. Whitaker stated that he believed it would not, since if Monticello sat unused for six months, evaporation losses would reduce its level only from 420.5 to 418 feet even though there are no creeks flowing into Monticello. (Tr. pp.1274-75). The only input is pumping from the Broad River or rainfall. (Tr. p.1276).

188. Whitaker explained that the Monticello Pumped Storage Project (as opposed to the service water pond dams) is not a safety-related facility. (Tr.1276). The existence of the reservoir serves two purposes: (1) to create a pumped storage

facility, and (2) to provide a cooling source for the condensers for the nuclear plant. (Tr. 1276). No NRC requirements came into play in the design and licensing of Monticello. (Tr. 1280).

189. Evaporation losses from Monticello are made up from the Broad River. (Tr. 1313). However, the Broad River is not critical to the safe operation of the Summer Facility. Monticello is separate and does not require much makeup as earlier indicated. (Tr. 1368-69). With no input from streams, it would take six months for evaporation to draw Monticello down one and one half feet. (Tr.1275). Seepage loss from Monticello represents only approximately 2 CFS for all dams at Monticello. (Tr.1370).

190. Under normal operating conditions the service water pond provides cooling for bearings, fan coolers, industrial coolers to support ancillary equipment as well as providing cooling during shut-down conditions for the RHR and diesel generators. (Tr.1375)

191. Insofar as its safe shut-down cooling function is concerned, Applicants have submitted an analysis of the ability of the service water pond, assuming worst conditions, to perform its design functions for safe shutdown. These conditions include water elevation of 415.0, evaporation, and seepage. (Tr.1308). There is a physical disconnect mechanism which prevents the water in the service water pond from dropping below the 415.0 ft. level. (Tr.1307, 1309).

192. The service water pond has a great deal of margin under extreme conditions, so that even assuming a loss of Monticello,

the pond can go considerably longer than the 30 day criteria set forth in the NRC Reg. Guides. The Applicants' FSAR figures 9.2.10 and 9.2.11 address these capabilities. (Applicants' Exhibit No. 5). (Tr.1368-1369).

193. The Board posed the question of a possible draw-down of the reservoir, i.e., limits on SCE&G's ability to draw the reservoir down and the possible impacts of a sudden draw-down on the reservoir with particular emphasis on the dam. 34/ The Federal Energy Regulatory Commission has specified in their license to SCE&G that SCE&G is prohibited from drawing the level of the reservoir down below 418.0 feet. (Tr. 1305). The normal draw-down level is 424.5 ft.. Going below 420.5 ft. requires FERC notification.

194. The Board inquired whether an earthquake would not produce an unloading of Monticello. (Tr.1318). The dams which would have a bearing on unloading of Monticello are the four dams enclosing Frees Creek which formed Monticello reservoir. (Tr.1318-19). While they are not seismic Category I dams, they are built to U.S. Army Corps of Engineers standards. (Tr. 1319). There is evidence of record that such dams have not failed in earthquakes, but we need not pursue that matter since Monticello is, as shown above, not needed for safe shutdown. The Category I dams are.

195. For the Category I dams there is instrumentation (piezometers to measure pore pressure) and survey monuments

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34/ In this instance, we were not asking for seismic possibilities.

to provide SCE&G information about the integrity of the dams. (Tr.1326-27). The record reflects that these dams satisfy the applicable regulatory requirements. We need not explore that matter further since the contention on that subject was withdrawn (see note 6 supra and accompanying text). In addition, for the non-category I dams there is a routine schedule of inspection which includes daily, weekly, and monthly inspections, along with five-year inspections by independent consultants which is required by FERC. (Tr. 1350).

196. One final issue which arose as a result of Intervenor examination outside the scope of an admitted contention or the testimony on hydrology was the subject of Service Water Pump House settlement. (Tr. 1362). The question of the Intervenor was whether the intake structure had settled more than anticipated. Since intervenor was on distribution for volumes of reports on this subject, this was not new information. It was duly confirmed by Applicants that there had been such settlement, but that it has been thoroughly and duly investigated, believed safe for operations, and that the NRC Staff seemed satisfied. Applicants pointed out, however, that it still was, at the time of hearing, an open item in the SER. (Tr. 1363). This is an issue for the Staff.

197. Applicants have adequately clarified the matters where the Board desired such regarding hydrological interaction between Monticello Pumped Storage Project and V.C. Summer

Nuclear Station. Nothing regarding the hydrological interaction between the two facilities suggests any significant safety concerns; any remaining matters are for the Staff.

INTERVENTOR'S CONTENTION A3 (ATWS)

"The applicant has not met the requirements of the NRC Staff to assure that the probability of occurrence of ATWS event is acceptably small."

198. As indicated in the background section of this Partial Initial Decision, both Applicants and the NRC Staff on May 7, 1981 filed motions for summary disposition on this contention as well as others. In a Memorandum and Order dated June 19, 1981, we ruled on those motions, granting only the motion with respect to Contention A3 (ATWS). Because of the nearness of the start of the hearings in this matter, we cited only a very abbreviated basis for the ruling, reserving until issuance of our Initial Decision a full exposition of the Board's reasoning. Thus, although the Board has summarily disposed of Contention A3, we herein fully state the basis for our decision. We also take this occasion to note the state of the record on the matter of generic safety issues in general, of which ATWS is one.

199. The ATWS contention proposed by Intervenor was admitted as a contention in the Board's Order of April 24, 1978 Admitting Contentions. In a series of orders dating back to 1978, the Board has requested and urged Intervenor to provide more information concerning his contentions, including Contention A3. In

response to a Board Order of December 30, 1980 requiring Intervenor to provide a comprehensive summary of his proposed evidence, including exhibits, regarding his admitted contentions, Intervenor filed (3 weeks late) only the following statement with regard to ATWS:

> "Testimony about the ATWS question is being prepared by the intervenor, Brett A. Bursey." (Bursey's letter to the Licensing Board dated February 23, 1981.)

200. At the April 7, 1981 final prehearing conference session, Mr. Bursey distributed a document purportedly prepared by Dr. Michio Kaku which Mr. Bursey claimed contained some discussion of the ATWS question. We were referred to pages 8 and 11 of that document. Item 12 on page 11 merely lists ATWS as one of a class of unresolved safety problems. Item a) of the document contains only a single sentence concerning a postulated result of an alleged power excursion initiated by ATWS. The ATWS issue as stated by Intervenor raises only the question of whether Applicants have met NRC Staff requirements for ATWS. Dr. Kaku's statement simply mentions consequences of an ATWS event without any analysis or discussion to show how such relates to Summer.

201. The final statement by Intervenor contained in the document distributed during the course of the April 7, 1981 prehearing conference and entitled "Summary of Contentions" is as follows:

> "The ATWS concern is an issue of generic consideration that has been in a rulemaking proceeding for years. It is the Intervenor's position that the V.C. Summer plant should be required to operate under any forthcoming NRC regulations for ATWS concerns and not allowed to circumvent these important safety considerations due to a date of filing for construction."

Intervenor's statement in this regard is apparently based on a supposition for which there is no evidence in the record of these proceedings or otherwise, i.e., that because of the vintage of the Summer unit, it will not be required to meet requirements duly imposed after rulemaking action with regard to ATWS.

202. ATWS is an unresolved generic safety issue. The Atomic Safety Licensing Appeal Board has outlined requirements for Staff review of unresolved generic safety issues when Applicants are allowed to commence construction or operation of a facility pending final resolution of the issues by the Commission. (Gulf States Utilities Company (River Bend Station Units 1 and 2), ALAB-444, 6 NRC 760 (1977)). The Appeal Board in Gulf States explained that there must be a description of (1) the investigation program and its projected completion date; (2) what, if any, interim measures have been taken; and (3) alternatives, if the program fails to resolve the problem.

203. Pursuant to 10 CFR §50.35(a), in that construction permit case, the Board needed "reasonable assurance" that there would be a "satisfactory resolution of outstanding safety questions prior to the operation of the facility" and that the operation would not "present an undue risk to the public health and safety". Id. at 778.

204. The Appeal Board in Virginia Electric and Power Company (North Anna Nuclear Power Station, Units 1 and 2), ALAB-491, 8 NRC 245 (1978), said further, with regard to unresolved generic safety issues, that there was a need for a "full and detailed"

explanation of why a plant should be permitted to operate, including: (1) the present status of generic study, and (2) all measures used at the plant while the topic is under study.

205. The Staff in this case has completed its review of the ATWS issue in accordance with the criteria in the River Bend and North Anna decisions. See SER §15.3.5 and Appendix C(Staff Exhibit No. 1): Supplement No. 1 to the SER Appendix C (Staff Exhibit No. 1(a)).

206. As to the specific generic safety issue of ATWS, the Licensing Board and subsequently the Appeal Board in Northern States Power Company (Monticello, Unit 1), ALAB-611, 12 NRC 301 (1980), upheld the position of the NRC Staff as characterized by the Appeal Board as follows:

> "[The Staff] believes it prudent to improve safety margins even further to protect the public. The Staff has not determined that there is a present risk to public safety from an ATWS event; rather, its position is that no unacceptable risk currently exists." Id. at 306, citing NUREG-0460 Vol. 3, pages 1-8, 42-44, and Vol. 4 at pages 3-6, 63-65.

The Appeal Board went on to consider the evidence in the record in that case on the proposition whether the facility in question could continue to operate safely pending an ATWS rulemaking. The Appeal Board quoted extensively from the evidence below and emphasized the procedures and training measures being taken to implement the Staff's recommendations. Id. at 306-308.

207. This case appears to be in all fours with Monticello, plus having advantage of the Westinghouse design. In Summer, it is clear from the summary disposition papers that the Applicants have proposed, and the NRC Staff has accepted, procedures and training designed to assure detection and appropriate mitigating action with respect to ATWS events; existing NRC requirements are met; and identified possible future requirements can and will be met as required. We can rely on the affidavits on summary disposition and have done so. Affidavit of William F. Kane appended to NRC Staff Motion for Summary Disposition, filed May 7, 1981 on Contention 3; and Affidavits of O.S. Bradham and Robert W. Steitler appended to Applicants' Motion for Summary Disposition filed May 7, 1981. There was nothing of substance in Intervenor's opposing papers. Therefore, there is no genuine issue of material fact, the moving parties are entitled to judgment, and summary disposition is granted.

LEGAL CONSIDERATIONS

208. It is clear that in this case summary disposition is an entirely appropriate means of dealing with the contention on ATWS (Contention A3). Intervenor Bursey neither raises an issue of material fact nor attempts to controvert any of the information supplied by the Staff and Applicants in support of their motions for summary disposition. He merely has made the barren claim that a generic resolution of ATWS

will not assure that the Summer plant will be properly retrofitted, and that ATWS should be resolved before operation. Contention A3 cannot in these circumstances present a substantial issue. Summary disposition (or summary judgment) is recognized by the Commission and federal courts as an appropriate device to separate substantial issues from insubstantial ones.

209. Pursuant to 10 CFR Section 2.749(d), upon an appropriate motion for summary disposition, "the presiding officer shall render the decision sought" where it is shown "that there is no genuine issue as to any material fact and that the moving party is entitled to a decision as a matter of law" (emphasis added). To provide more definitive guidance in rendering such judgments, the Commission stated that Section 2.749 "has been revised to track more closely the Federal Rules of Civil Procedure." See 37 Fed. Reg. 15135 (1972). 35/ Thus, to defeat summary disposition, an opposing party must present facts in the proper forms; conclusions of law will not suffice (Pittsburgh Hotel Association, Inc. v. Urban Redevelopment Authority of Pittsburgh, 202 F. Supp. 486 (W.D.Pa. 1962), aff'd 309 F.2d 186 (3d Cir. 1962), cert. denied 376 U.S. 916 (1963). Intervenor presented no substantial facts whatsoever. In view of this, the Board had but one choice - to grant Staff's and Applicants' requested relief.

35/ See also, Alabama Power Company, (Joseph M. Farley Plant, Units 1 and 2), ALAB-182,7 AEC 210, 217 (1974); Public Service Company of New Hampshire, (Seabrook Station, Units 1 and 2), LBP-74-36, 7 AEC 877, 878 (1974); Gulf States Utilities Co. (River Bend Station, Units 1 and 2), LBP-75-10, 1 NRC 246, 247 (1975).

FURTHER DISCUSSION ON GENERIC SAFETY ISSUES

210. The Atomic Safety and Licensing Appeal Boards have issued two decisions which provide guidance to both the NRC Staff and the Atomic Safety and Licensing Boards in their consideration of "generic safety issues." These decisions are Gulf States Utilities Company (River Bend Station, Units 1 and 2), ALAB-444, 6 NRC 760(1977), and Virginia Electric and Power Company (North Anna Nuclear Power Station, Units 1 and 2), ALAB-491, 8 NRC 245 (1978)). We note that the Staff's evaluation of these matters must be in the public record, and that the Board's review of these matters must ". . . entail an inquiry into whether the Staff review satisfactorily has come to grips with any unresolved generic safety problems which might have an impact on the operation of the nuclear facility under consideration." (River Bend, 6 NRC at 774-75).

211. Except for the issue of Anticipated Transients Without Scram ("ATWS"), no unresolved generic safety issues were placed in controversy in these proceedings. The Board did alert the Staff as to its responsibility to explain why it is satisfactory that unresolved safety issues not be resolved prior to licensing. (Third Prehearing Conference, Tr. 320). Irrespective of what matters may or may not have been properly placed in controversy, it is incumbent upon the Board under ALAB-444 and ALAB-491 to make a finding,

inter alia, that there is "reasonable assurance that the facility can be operated without undue risk to the health and safety of the public." In the view of the Appeal Board in River Bend:

> "the Board should therefore be able to look to that document [SER] to ascertain the extent to which generic unresolved safety problems which have been previously identified in an FSAR item, a Task Action Plan, an ACRS Report or elsewhere have been factored into the Staff's analysis for the particular reactor -- and with what result. To this end, in our view, each SER should contain a summary description of those generic problems under continuing study which have both relevance to facilities of the type under review and potentially significant public safety implications.
>
> This summary description should include information of the kind now contained in most Task Action Plans. More specifically, there should be an indication of the investigative program which has been or will be undertaken with regard to the problem, the program's anticipated time span, whether (and if so, what) interim measures have been devised for dealing with the problem pending the completion of the investigation, and what alternative courses of action might be available should the program not produce the envisaged result." (6 NRC at 775).

212. In April of 1981, the Staff issued Supplement No. 1 (Staff Exhibit 1(a)) to NUREG-0717, the Safety Evaluation Report related to the Summer Station. Appendix C of Supplement No. 1 contains an updated discussion of generic safety issues.

213. With the documentation described above, the Board now has a sound record to review in order to evaluate the present situation. The Staff has provided a thorough description of its extensive program for dealing with generic issues in Staff Exhibit 1(a). From them, we learned that, as unresolved safety issues are identified through a variety of sources (NRC Staff

and Advisory Committee on Reactor Safeguards safety review; vendor, architect/engineer and utility design reviews; experience from operating reactors, and research results), the need for immediate action to assure safe operation is assessed. This assessment includes consideration of the generic implications of the issue. In some cases, immediate action is taken to assure safety; in other cases interim measures, such as modifications to operating procedures, may be sufficient to allow further study of the issue prior to making licensing decisions. In most cases, however, the initial assessment is that immediate licensing actions or changes in licensing criteria are not necessary. In any event, further study may be deemed appropriate to make judgments as to whether existing NRC Staff requirements should be modified to address the issue for new plants or if backfitting is appropriate for the long-term operation of plants already under construction or in operation. Seventeen "Unresolved Safety Issues," addressed by twenty-two tasks in an NRC unresolved safety issues program have been identified. The Staff lists those in the SER Supplement No. 1 for the Summer facility. (Appendix C to Staff Exhibit 1(a)).

214. In the view of the NRC Staff, the "Unresolved Safety Issues" contained in that list of seventeen are the substantive safety issues referred to in ALAB-444 where it speaks of ". . . those generic problems under continuing study which have. . . potentially significant public safety implications." (Id. at p. C-5).

215. The Staff has determined that eight of the twenty-two tasks identified with the "Unresolved Safety Issues" are not applicable to the Virgil C. Summer Nuclear Station, Unit 1: six of these eight tasks are peculiar to boiling water reactors; two of the tasks address steam generator tube problems in Combustion Engineering and Babcock and Wilcox plants. Summer is a Westinghouse Plant. With regard to the remaining fourteen tasks that are applicable to this facility, the NRC Staff has issued NUREG reports providing its proposed resolution of five of these issues. Each of these have been addressed in the SER or will be addressed in a future supplement to the SER. The Staff includes a table in Supplement No. 1 of the SER listing those issues and the section of the SER in which they are discussed. (Id. at p. C-5). With the exception of three of the tasks, Task Action Plans for the remaining generic tasks applicable to the V.C. Summer Nuclear Station, Unit 1 are included in NUREG-0649, "Task Action Plans for Unresolved Safety Issues Related to Nuclear Power Plants." With regard to one of the remaining three tasks, a technical resolution has been proposed by the NRC Staff in Volume No. 4 of NUREG-0460, issued for comment. Task Action Plans for the remaining two tasks were issued in January, 1981 and July, 1980.

216. Each Task Action Plan provides a description of the problem; the Staff's approaches to its resolution; a general discussion of the bases upon which continued plant licensing or operation can proceed pending completion of the task; the technical organizations

involved in the task and estimates of manpower required: a description of the interactions with other NRC offices, the Advisory Committee on Reactor Safeguards and outside organizations; estimates of funding required for contractor-supplied technical assistance; prospective dates for completing the task; and a description of potential problems that could alter the planned approach on schedule. (Id., at p. C-6).

217. The Staff has reviewed the ten "Unresolved Safety Issues" applicable to the Virgil C. Summer Nuclear Station, Unit 1. Based on their review, they have concluded that "there is reasonable assurance that this facility [V.C. Summer Nuclear Station, Unit 1] can be operated prior to the ultimate resolution of [those] generic issues without endangering the health and safety of the public." (Id., at p. C-6).

218. We conclude that the Staff has set forth these problems, programs, and bases clearly and rationally and the public record of the proceeding now reflects the Staff's views and perception of these elements.

219. In each instance, the Staff has concluded that one or more of the following bases for continued licensing applies (indicating which ones apply to each issue): (1) improvements that will result from the applicable task will be procedural and can be implemented after operation of the facility begins, if necessary; (2) there will be no safety implications until after years of operation and there will be opportunity for reevaluation and alternative means will exist to avoid undue risk to the public; (3) a resolution can reasonably be expected before operation;

(4) short-term or interim actions have been developed and implemented pending extended rulemaking proceedings; (5) the problem has been resolved for the reactor under study; or (6) presently adequate criteria can be improved. The Board has determined that the documentation furnished by the Staff with respect to these applicable generic safety issues has satisfied the applicable guidance and the Board's concern on all issues.

220. The Board concludes that the Staff's evidence on generic safety problems is consistent with River Bend. The Staff has thoroughly explained its program for the review of the generic tasks to determine whether a plan for resolution is required. And, most important, the Staff has explained why licensing can safely proceed in the face of the problem.

221. With these elements, the Staff has met the substantive requirements of River Bend. We have undertaken to ascertain whether the Staff dealt appropriately with the "unresolved" issues in this operating license proceeding. We have looked to see whether the generic safety issues have been taken into account in a manner that is reasonable from a regulatory point of view and would be adequate to justify operation. We have searched the entire record to see if there are adequate explanations on all the issues pertinent to the V.C. Summer Nuclear Station, Unit 1, and have found that there is a basis, not only on ATWS but on all generic issues, for the Staff's decision to allow operation to go forward.

222. Accordingly, there is nothing with respect to the generic safety issues which prevents this Board from finding under

10 CFR § 50.57(a)(3) that the Virgil C. Summer facility can be operated without endangering the health and safety of the public.

INTERVENOR'S CONTENTION A10

I. Introduction

A. The Contention

223. Intervenor Bursey's contention A10 on health effects, as admitted by this Board's "Order Admitting Contentions" of April 24, 1978, was as follows:

> "Contention A10 The following effects -- on a long-term basis -- have been sufficiently understated 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 operations, 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. (Should the Commission modify Table S-3 prior to the litigation of this contention, the Board will entertain motions from any of the parties respecting modifications to this contention.)"

B. Background

224. On May 7, 1981, Applicants moved for summary disposition of this contention (with supporting memorandum and affidavits). 36/ On May 27, 1981 the NRC Staff filed a response in support of the motion, based on the FES and an accompanying affidavit. On approximately May 28, 1981, Intervenor Bursey filed an opposition to this contention along with certain

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36/ Corrections were filed on May 13, 1981.

prefiled testimony. In this Board's Order of June 19, 1981, we denied the motion for summary disposition of contention A10. We indicated the need to hear evidence on (1) whether the population samples in the health effects studies relied upon by Applicants and Staff were, as claimed by Intervenor's witness Morgan, biased so as to yield unreliable results, and (2) whether new dosimetry of Hiroshima and Nagasaki atomic bomb radiation would change the derived health effects of gamma radiation. (Order at 4).

C. The Evidence

225. The principal evidence on this contention consisted of the FES (Staff Ex. 3, Tr. 2385); the prefiled (Tr. 1545) and oral testimony (Tr. 1519-1679, 2485-2509) of Intervenor's witness Morgan; 37/ the prefiled (Tr. 2406-07) and oral (Tr. 2385-2484; 2503-2507; 3822-3837) testimony of Staff witness Branagan; the prefiled (Tr. 2380) and oral (Tr. 2321-2484) testimony of Applicants' witnesses Hamilton; and the prefiled and oral testimony of Applicants' witness Barker (Tr. 382? 3862).

37/ Intervenor had designated or referred to a total of four witnesses on this contention. In addition to Dr. Morgan, they were: Chauncy Kepford (for whom no summary of testimony nor prefiled testimony was filed -- see n.9 in Applicant's motion for Summary Disposition of Contention A10); Dr. Michio Kaku, a physicist, whose prefiled testimony on this contention was to the same the effect as Dr. Morgan's regarding atomic bomb radiation dosimetry etc. and was excluded as cumulative (Tr. 1690-91); and Dr. Helen Caldicott, a physician, for whom a paper was prefiled but who did not appear and testify.

D. Overall Resolution of Contention A10

226. While there is much disagreement on subsidiary points between Intervenor's witness Morgan on the one hand and, on the other hand, Staff witness Branagan and Applicants' witness Hamilton, there was no material disagreement given the uncertainties involved (and no real support for the Intervenor's contention) at the level colloquially known as the "bottom line". That conclusion emerges principally from Dr. Morgan's pre-testimony somatic risk estimations revealed in his publications, departure from which was never substantiated, and his acknowledgment that his latest estimates were outside the range of accepted (endorsed by the Commission in Black Fox, infra) risk estimates. The previously published risk estimates by Dr. Morgan, and by certain conservative but recognized authorities whose work was relied upon by Dr. Morgan, implied health effects within the range shown in the FES. (Hamilton at Tr. 2379). At the "bottom line," Dr. Morgan candidly admitted that he had no recommendation against operation based on estimated health effects. (Tr. 2497-98; See also FES §§9.4 and 9.6; Branagan at Tr. 2497-98; Morgan at Tr. 1644, 1658-59). Ultimately, as the record has been clarified, there is no real controversy on genetic effects estimates. (See Branagan at Tr. 3822-3830; cf. Tr. 2460-61). Intervenor was given the opportunity to work out an agreement with the parties or, failing that, to

move for admission of a post-hearing affidavit by Dr. Morgan in response to Tr. 3822-3830. (See Tr. 3830-35). He did not do so. Therefore, Dr. Branagan's clarification stands and there is no material controversy for the Board to resolve on genetic estimates.

227. That Dr. Morgan's own estimates of somatic and genetic risks are outside the range of authoritative opinion generally accepted in the scientific community, as explained by Dr. Branagan, is also uncontroverted. There is nothing persuasive in the record to suggest otherwise. Dr. Hamilton was in agreement with the FES estimates, and Dr. Morgan did not, at bottom, challenge the significance of any underestimate. (Tr. 1658-59 and 2497-98). Our conclusion in this regard is unaffected if we add in the health effects of radon, as discussed infra. Thus, the record does not contain any basis to alter the conclusion in the FES, which we endorse as to health effects of operation and the fuel cycle. The FES concludes that the cost benefit balance struck at the construction permit stage is not significantly affected by the environmental costs associated with routine operating releases or public exposure as a result of the associated fuel cycle. (FES §9.1, 9.4, 9.6 and Table 9-1. See also §§4.5 and Table 4.20. Branagan testimony at Tr. 3830. See Morgan at Tr. 2497-98).

228. In the following sections, we explain why the record would not support the inference, even had Dr. Morgan reached a conclusion to that effect, that somatic and genetic health effects of routine operations and the fuel cycle have been significantly underestimated. These may be considered subsidiary and, in some cases, alternative findings.

II. Detailed Findings on Contentions and Questions

A. The Legal Standards and the Weight of the Evidence

229. The Commission reaffirmed last year that the health effects of routine operation may be adjudicated in individual licensing proceedings. Public Service of Oklahoma (Black Fox Station, Units 1 and 2), CLI-80-31, 12 NRC 264 (1980). This is because the Commission has not explicitly adopted as part of its regulation the final environmental statement which was part of the Appendix I rulemaking record and which quantified the health effects conservatively estimated to be associated with the regulatory release values therein. (CLI-86-31 at 277). A similar rule obtains with respect to fuel cycle release values,38/ which, with the exception of radon as already noted, are quantified in Table S-3 to Part 51; the health effects of the fuel cycle including radon may be litigated. (See, e.g., ALAB 640 infra). In Black Fox, the Commission endorsed the use of the linear hypothesis and the risk estimators based thereon of the 1972 BEIR I report. The question here is whether any serious

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38/ The contention here does not challenge the release values used and was not amended to embrace such values; however, we cannot use the Part 51 Table S-3 values for radon which have been stricken. Hence, we will use the latest values determined by the Appeal Board for radon released as a result of uranium mining and milling as discussed infra.

defect in the linear hypothesis as set forth in the 1972 BEIR report and corroborating authoritative works has been demonstrated.39/

230. As already noted, Intervenor's evidence in this regard consisted of the testimony of K.Z. Morgan, an eminent health physicist for some fifty years. Applicants did not object to opinion testimony by Dr. Morgan in his field of expertise, health physics, nor even to Dr. Morgan testifying as to calculations he had made of health effects to the extent these were appropriately made using generally accepted risk estimators. Applicants did object to Dr. Morgan giving opinion evidence which amounted to derivation or selection of risk estimates (Tr. 1540-46), because of lack of expertise in epidemiology or medicine or genetics. Dr. Morgan did not claim training as a physician or geneticist or epidemiologist. (Tr. 1523-26). Therefore, having heard all of the evidence, the Board has been constrained to discount his testimony where he purported to derive or select non-standard factors for the estimation of somatic or genetic risks. As a result, the risk estimates based on the linear hypothesis as set forth conservatively in BEIR I of 1972 and endorsed by the Commission in Black Fox, supra, stand

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39/ The reports relied upon by Applicants for risk estimators (damage functions) were primarily BEIR I, UNSCEAR 77, and the straight line portion of BEIR III (Hamilton Affidavit pp. 4-5, Tr. 2380). The reports relied upon by Staff were primarily the linear non-threshold dose response model and the absolute risk model of BEIR I (1972), although other risk estimators were compared, including NCRP and UNSCEAR. (Branagan Testimony pp. 2-3 and Attachment 2, Tr. 2406-07).

essentially uncontroverted, as do the estimated health effects (for both routine operation and the fuel cycle) based thereon as set forth in the FES, the affidavits, prefiled testimony, and oral testimony of Dr. Hamilton and the prefiled, and oral testimony of Dr. Branagan. We return to those estimates infra.

231. In summary, we cannot give any weight to risk estimates implicitly or explicitly derived by Dr. Morgan which are not supported by the consensus of accepted, authoritative scientific opinion, while the health effects estimated by Staff (and corroborated by Applicants) 40/ using the generally accepted risk estimators, were shown to be appropriate estimates given the uncertainties acknowledged. The most that can be said for Dr. Morgan's testimony is that it points to a minority viewpoint which holds that the uncertainties in risk estimates (and hence the proportional effects), for low LET radiation may be larger than the vast majority of scientific opinion holds. That minority viewpoint did not withstand analysis, and in any event was not substantiated as showing defects in the accepted risk estimates

232. Had we given any weight to Dr. Morgan's opinion testimony on the possible non-conservatism of the linear hypothesis, we could have given his views in the area of genetic effects no weight at all because of his clear disavowal of expertise or careful preparation of estimated effects in the

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40/ We have found both Dr. Hamilton and Dr. Branagan to be qualified as experts on all matters to which they testified.

genetic risk area. 41/ We would have concluded that his testimony not only did not demonstrate, but did not even claim to have demonstrated, any underprediction of somatic health effects significant to this proceeding but at most to suggest a possibility of some relatively insignificant underestimate. His own published risk estimator as given in a recent paper of his and, that favored by Dr. Radford, one of the more conservative among the recognized authorities on whose work Dr. Morgan relied, would produce effects within the range given in the FES. Branagan rebuttal (following Tr. 2406-07) at 4, 9, 10; Hamilton Tr. 2379. Dr. Morgan's estimate during his oral testimony was outside the range of the consensus of recognized scientific opinion. Again, Dr. Morgan did not contradict the conclusion in the FES Sections 9.4 and 9.6 that neither the health effects of normal operation nor the fuel cycle would alter the favorable cost-benefit balance. (Tr. 2497-98. See also Branagan at Tr. 3830). We now turn to a more detailed discussion of the evidence on Dr. Morgan's principal points.

B. Dr. Morgan's Criticisms

233. As noted at the outset, the Board expected, at the time of ruling on summary disposition, to have to resolve two major points having to do with the studies and reports

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41/ In any event, Dr. Branagan in his second appearance (Tr. 3822 ff.) satisfactorily resolved the apparent confusion in the record at the time of Dr. Morgan's earlier appearance. See the detailed discussion infra.

relied upon by Applicants and Staff. These points were that:

- the population samples used in the health effects studies reviewed by the BEIR Committees for Hiroshima and Nagasaki and for ankylosing spondylitis were statistically biased and hence yielded unreliable results; and
- a recently reported study of the atomic bomb dosimetry indicated that earlier reports relied upon by the BEIR Committees underestimated the gamma radiation to which the populations at Hiroshima and Nagasaki were subjected.

234. On the record, Dr. Morgan did state his belief that the risks of low-level exposure to ionizing radiation are greater than indicated by Applicants and Staff, because the reports on which they relied underestimate the risk (Tr. 1548). But, as discussed infra, Dr. Morgan's arguments in these areas were not borne out.

235. The following areas of evidence support our conclusion that the points raised by Dr. Morgan should be resolved in line with the great weight of authoritative scientific opinion which supports the conclusions drawn by Staff and Applicants and which does not support the views of Dr. Morgan. The central issue is whether the data on exposed groups on whom data exists is statistically biased such that the studies and reports relied upon by Applicants and Staff may understate the risk of low level radiation, leading to possible understatement of the health effects associated with routine operation of the plant and the pro-rata share of fuel cycle exposures (including radon discussed separately below) corresponding to the fuel requirements for the plant. The evidence on each major point is resolved as follows:

1. Japanese Data

236.(a) According to Dr. Morgan, premature deaths due to fire, blast and trauma and ensuing disease were not considered by the BEIR Committee, and the others relied upon. 42/ (Tr. 1663-65, Tr. 1673-74). This thesis was taken into account in the BEIR III report. (See Branagan prefiled at 6, Tr. 2406-07; and Tr.2396). The important point in identifying a possible lack of utility in the Japanese survivor

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41/ Both Applicants and Staff tesified that there were several reports each of which considered many pillars of knowledge relied upon in BEIR I and III, UNSCEAR and the NCRP works. See footnote 39 supra.

data is its consistency with other data. (BEIR III at 156-157 as read by Branagan prefiled testimony at 6; Tr. 2395-96; Hamilton at 2343-45, 2445-46). The Japanese data is in good agreement with the other data discussed below.

237. (b) Specifically on consistency with other data, Dr. Morgan's argument was that there is a lack of consistency between the Oxford Childhood Cancers Study and the Japanese data (see e.g. Tr. 1605). But it was shown that, after corrections made by Dr. Alice Stewart and her colleagues, the Japanese and Oxford data are consistent. (Branagan prefiled testimony at 6, Tr. 2406-07; Hamilton at 2346-48 2351-56). Hamilton found no conflict between the Japanese data and the corrected Oxford data. (Tr. 2352-56). Dr. Morgan had previously agreed that estimates of less than twenty leukemia deaths per million per year per rad would be in good agreement with a 15-18 deaths estimate (Tr. 1606) which it was subsequently shown would be the result of the corrected Oxford data (Tr. 2346-48, 2352-56). In fact, it appeared that Dr. Morgan had overlooked or had forgotten the corrections to the original dose estimates in the Oxford data, even though he was on the same panel when the correction was presented by Dr. Stewart's colleague, D. Draper. (Compare Tr. 1606-07 with Tr. 2352-56).

238. (c) Dr. Morgan's prefiled testimony was to the effect that new dosimetry suggests that reports which rely on earlier interpretations of Japanese survivor data may have under-

estimated the gamma dose. This was an unfortunate episode in which Dr. Morgan apparently based his prefiled testimony on a News and Comment article in Science magazine, without having even seen the article, much less the underlying paper. (Morgan prefiled testimony, Tr. 1545, at 5; Morgan at 1598, 1602). Dr. Morgan acknowledged that the article was not peer reviewed and should be used cautiously. Dr. Hamilton disapproved of such a practice and quoted from letters of protest to Science. (Tr. 2341-43). Dr. Morgan did not disagree that the Hiroshima gamma radiation estimates used prior to the most current proposed corrections would have led to overestimates of health effects, while the Nagasaki data was not significantly different. (Tr. 1598-1603). While Dr. Morgan seemed steadfastly to adhere to the possible significance of the new dosimetry, it appears to us more likely that, when the peer review process of the LRL papers has been complete, there may be changes in the radiobiological effectiveness (RBE) of neutron exposure than that the new interpretations of Japanese dosimetry will have any effect tending to suggest a greater risk of exposure to gamma radiation at any level. Dr. Morgan admitted that one of the authors of the paper proposing corrected dosimetry did not agree with his interpretation (Tr. 1621-22). It was also brought out that Dr. Morgan had not been aware of the work of Straum and Dobson, col-

leagues of Loewe at Lawrence Livermore Laboratories, which suggests that the new data may lower the BEIR risk estimates for low doses of gamma radiation (Tr. 1622). Dr. Morgan acknowledged their competence. (Tr. 1629). Dr. Morgan relied upon his understanding of Dr. Radford's opinion, but it was established that Dr. Radford thought the new dosimetry would support a straight-line linear dose response, which Dr. Morgan admitted Dr. Hamilton used and Dr. Branagan used in the FES and in his testimony (Tr. 1628). See Branagan prefiled (Tr.2406-07) at 7-9, Branagan Tr. 2397-98, and Hamilton at 2339-2343. Ultimately, Dr. Morgan stated that he could not make any "final conclusion" based on the new dosimetry nor finalize his opinion, "until I see more hard facts." (Tr. 1655). Dr. Morgan also acknowledged that he (as well as all witnesses and authorities) were applying judgment, and by implication that he would not definitively say whether the "risk quotation" should be $3x10^{-4}$ or $9x10^{-4}$ or even at a different order of magnitude (Tr. 1658). Dr. Morgan characterized the risks as not such as to warrant suspending operation of nuclear plants. (Tr. 1658-59). In fact, Dr. Morgan still adheres to the view that it would be more cost effective to reduce the unnecessary use of x-rays in medical diagnosis than to reduce the environmental exposure from a nuclear power plant. (Tr. 1659).

239.(d) Dr. Morgan further argued that extrapolation of high doses down to low doses of low LET radiation at low dose

rates may underestimate the risk, primarily because of reports which suggest that a superlinear hypothesis (to which Dr. Morgan gives credence at Tr. 1647-48 but the other witnesses do not, e.g., Tr. 2331, 2422-23, 2398-99) would fit the data better than a curve showing a lesser effect per unit exposure at low doses and dose rates.

While there was much discussion of this matter on the record, the evidence can be very briefly summarized. There are a number of references which could be used to support an argument that there may be a greater effect at lower doses than at high ones, but none of them withstand analysis. All such references (or the same arguments or data relied on) have been considered and discounted for stated reasons by the expert bodies which derived the risk estimates used by Applicants and Staff. While the possible fit of a superlinear hypothesis to some of the data is acknowledged in the GAO Report, (referred to in the references infra) that same report indicates that such fact does not establish the superlinear hypothesis as the correct one. As Dr. Hamilton explained, the literature acknowledges, as he does, that if there were large, exquisitely sensitive groups in the population, the cancer induction in such groups would tend to make the population risk

somewhat greater at low doses and dose rates than the straight line linear, but the existence of such large groups having characteristics not already included in the heterogeneous population for which data exists simply has not been established by anyone. (Tr. 2320-29, 2331, 2366-70, 1635, 2371-74, 2374-77, 2377-78, 2379-80, 2398-99, 2422-23, 2425, 2429-31; Hamilton affidavit, pp. 3-14. Tr. 2380; Branagan testimony pp. 9-10, Tr. 2406-07).

2. Ankylosing Spondylitis Data.

240. Dr. Morgan's additional argument about reliance on the reports from which the conventional risk estimates used by NRC are taken was that the ankylosing spondylitis data should have been corrected to reflect cancer-masking premature deaths from other causes in the allegedly select population. This is an argument similar to that regarding fire, blast, trauma, and ensuing disease among the Japanese survivors tending to select out some persons who may have developed cancer had they survived. Here too, Dr. Morgan (perhaps because of lack of training in epidemiology) was on shaky ground. In a nutshell, it was persuasively and conclusively demonstrated by Dr. Hamilton that if Dr. Morgan's thesis were correct, then there would be a deficiency of cancers in the unirradiated ankylosing spondylitis patients as compared to the general population, but the same numbers of cancers occur at the same times. In other words, the

In other words, the spondylitis patients are not a select population, not atypical as a group of the heterogeneous population at large. (Tr. 2356-2361. See also Morgan at Tr. 1609-1612, 2450-57; Branagan Tr. 2397 and prefiled Tr. 2406-07 at 7).

(3) Animal Studies

241. To the extent Dr. Morgan's original criticism of the reports relied upon by Applicants and Staff questioned their use of animal studies and included the claim that such were used in deriving human somatic risks, that claim was simply not borne out (Tr. 2361-62) and Dr. Morgan did not press this point (Tr. 1669-72). Animal studies are used in deriving genetic risk estimates, because they are the only useful data available given the time periods involved in human genetic Studies. (Tr. 2362-64; see Tr. 1669-72).

(4) Genetic Risks

242. Dr. Morgan acknowledged his lack of background in the genetic risk area, stated his long-standing personal view that somatic risk was more important, acknowledged the lack of any scientific basis for the views expressed by some that invisible genetic risks might increase the risk by large factors, agreed that genetic effects were yet to be observed on humans, and stated that it was very difficult to be quantitative about genetic risks. (Tr. 1675-77). Nonetheless, Dr. Morgan hazarded his own values. (Tr. 2496-99). Dr. Branagan gave the Staff's

genetic risk estimators of 260 potential cases of all forms of genetic disorders per million person rem (and the uncertainty bands) as well as the calculated genetic disorders from the principal source of exposure: occupational exposure (Tr. 2460-61). The genetic risk was again addressed by the Staff witness at Tr. 2504, which he later clarified at some length (Tr. 3822-28). In the course of this clarification, Dr. Branagan systematically compared the values used by the Staff on the one hand and by Dr. Morgan on the other, with the values in the recognized scientific literature, and showed that the Staff values were in good agreement with the authoritative estimates while Dr. Morgan's estimates far exceeded them. The value estimated by Dr. Branagan for this proceeding using the geometric mean approach was nine potential genetic disorders (0.3 genetic disorders for 1300 person rem times 30 years), while the highest value given in BEIR I (1500 genetic disorders per million person rem) would conservatively predict about 60 genetic disorders over 30 years. (Tr. 3827-29). The record does not reflect any scientific basis for Dr. Morgan's 1700 genetic disorder estimate, and we cannot accept it. We find that the Staff estimates are in good agreement with the authoritative literature.

C. Radon (Board Question)

243. There was no conflict in the evidence regarding radon releases and associated health effects. This matter was raised as a Board question at the November 25, 1980 prehearing conference (Tr. 299-300); contention A10 had never been amended to reflect

the fact that both radon release values and , associated health effects could be litigated by the parties. 43/

244. The evidence on radon releases during and after uranium mining and milling consisted principally of the FES, Dr. Hamilton's prefiled testimony on radon and a supplement thereto (following Tr. 2380), Dr. Hamilton's oral testimony (Tr. 2331-36) and Dr. Branagan's oral testimony (Tr. 2463, 3829-30). Dr. Hamilton calculated the increased individual risk of cancer mortality as 5.3×10^{-11} per gigawatt per year, and found that to be an infinitesimally small risk when compared to the risk from natural background radon, which he calculated to be, 10^{-9} times greater for the lung, 10^{-8} times greater for whole body, and 10^{-7} times greater for bone. (Tr. 2334 and prefiled testimony on radon Tr. 2380 at pp. 7-8 and Tables LH-4 and LH-5).

245. Anticipating a question thus far raised but not definitively answered in other proceedings, Dr. Hamilton also gave separate estimates to the close-in population in the vicinity of mines and mills (1-100 Km distance) (Tr. 2336 and Supplementary Testimony following Tr. 2380). He estimated the excess cancer mortality risk to such close-in groups to mills and open-pit mines (noting that underground mines would produce a much lesser effect to the population). For example, the sum of the increased risks of cancer mortality for an individual living within 10 Km of the mill would be slightly greater than one in

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43/ See the text of the contention, paragraph (b), supra, p. 98 and the history of the radon litigation in other proceedings in ALAB-640, p. 117 infra.

one million, and within 10 Km of the mine somewhat greater than 5 in ten million. The very closest populations reflect a higher risk, with the greatest risk being to an individual within one Km. of the mill, somewhat less than 5 in 100,000. (Hamilton Supplement at Exhibit LH-6). In his main prefiled testimony on radon, Dr. Hamilton derived radon release values for Summer as per the Appeal Board decision in Philadelphia Electric Company, et al., ALAB-640, May 13, 1981. There appears to be no need to set Exhibits LH-1 through LH-5 out in extenso; suffice it to say that at release values consistent with ALAB-640, Dr. Hamilton derived the above miniscule individual risks to individuals in the population at large, and the risks to close-in populations, from radon released during and after uranium mining and milling. Dr. Branagan testified that the number of health effects in terms of fatal cancers would be about 15 potential deaths over a 100 year period. This included 400 years of radon exposure following the generation of tailings for 30 annual fuel requirements. Dr. Branagan later supplemented his testimony (Tr. 3829-30) to reflect the values in ALAB-640 which were higher than used in the FES. Using the 6600 curie (ALAB-640) rather than 1590 curie (FES) values, and what ALAB-640 terms case 2 (unsealed mines, covered tailings), would not significantly increase the effects estimated in the FES. In summary, Dr. Branagan concluded that use of the new radon values would not change the validity or the overall cost-benefit balance. (Tr. 3829-30). See FES §§9.1 and 9.6, Tables 4.20 and 9.1.

246. The Board is satisfied that the health effects to the public of radon released during and after uranium mining and milling do not disturb the conclusion given in FES §9.1 Since there was no controversy of record regarding release values 44/ or health effects for other isotopes released in fuel cycle activities, there is no need for us to make findings on them. Dr. Branagan noted that the major health effect contribution for the fuel cycle would be radon (Tr. 2411). His estimate was about 15 cancer deaths due to the Summer 30 year share of the fuel cycle, mostly due to radon (Tr. 2463). We would not find that value to tip the balance just discussed.

D. Benefits (Per FES)

247. We have above endorsed the conclusion of the Staff that, contrary to contention A10, the health effects of routine operation and the fuel cycle have not been underestimated so as to disturb the cost-benefit balance for operation nor the balance reached at the construction permit stage (as per the FES §9.1). While we are not called upon either by the contention or the evidence to assess the benefits on the other side of the balance from these health effects costs, and do not purport to raise an issue regarding them (10 C.F.R. §2.760a), it is worth noting where the benefits are to be found in the record. The reader/ reviewer is accordingly referred to the FES (Staff Exhibit 3)

44/ The release values are as in Table S-3 of 10 C.F.R. Part 51. See FES Table 4.20.

§§9.1, 9.2, and 7, which are uncontroverted on the record. We have no reason to disturb the Staff Assessment of benefits, and have used them in our overall Part 51 conclusions, infra.

III. ALARA (Board Question)

248. This subject is somewhat related to, but separate from contention A10. The Board indicated in its Order Admitting Contentions of April 24, 1978 (pp. 11-12) that it might have questions for the Applicants regarding how they would go about performing necessary maintenance activities while maintaining radiation exposures to workers as low as reasonably achievable ("ALARA"). From the testimony of Dr. Barker (Tr. 3822-3862), which was uncontroverted by evidence of record, the Board satisfied itself that SCE&G understands, is committed to, is implementing, and will verify satisfactory performance of, a program and procedures to maintain occupational exposures as low as reasonably achievable.

CONCLUSIONS

249. The Board has reviewed the entire record of this proceeding, including the proposed findings of fact and conclusions of law submitted by the parties. All of the proposed findings and conclusions submitted which are not incorporated directly or inferentially in this Partial Initial Decision are herewith rejected as being either unsupported by the weight of credible evidence or as being unnecessary to the rendering of this Partial Initial Decision.

250. In an operating license proceeding the Board is called upon to decide only the issues in controversy among the parties (10 C.F.R. §2.760a and Appendix A to 10 C.F.R. Part 2, §VIII). In this case, the contentions and evidence have placed in issue the general subjects of financial qualifications, seismic design, emergency planning, quality control in construction, long-term health effectsand related matters, hydrology and management abilities, and altitudes and inter-corporate relationships. This partial decision does not resolve either the seismic or the emergency planning matters.

251. Although the Board's resolution of environmental matters is not materially different from that by the Staff in the Final Environmental Statement (Staff Exhibit 3), the Board is mindful both of the provision in 10 C.F.R. Part 51 (Section

51.32(b)(3), which states in effect that the FES is deemed modified by this Board's decision), and also of the Commission's own direction with respect to the proper handling of such matters as the uranium fuel cycle issue (revolving around Table S-3).

252. The burden of that direction is that when there is some possibility that the overall cost-benefit balance may have been affected by the Board's assessment of an impact somewhat differently from the FES, the Board should consider whether the change is so significant as to tip the overall cost-benefit balance. Accordingly, this Board has done so on the entire record, taking into account its own assessment especially of the health effects, including radon factors indicated above. This, in turn, has required the Board to consider whether the margin favoring licensing action in the FES cost-benefit balance by the Staff was a close one, which it was not, and the adequacy of the Staff review. In that regard the Board has satisfied itself that the FES is an adequate and comprehensive assessment of the factors to be considered under NEPA. We find that the totality of the changes before us (primarily updating the FES to comport to ALAB-640) are not so significant as to tip the cost-benefit balance against the action otherwise indicated, i.e., issuance of an operating license.

253. Accordingly, in accordance with the Atomic Energy Act and the Commission's Regulations, and on the basis of the entire record in this proceeding and the foregoing discussion and findings, the Board concludes as follows:

(1) The Environmental review conducted by the Commission's Regulatcry Staff pursuant to Section 102(2)(A), (C) and (E) of NEPA and 10 C.F.R. Part 51 is adequate;

(2) The requirements of Section 102(2)(A), (C) and (E) of NEPA and 10 C.F.R. Part 51 have been complied with in this proceeding;

(3) Having considered and decided all matters in controversy among the parties, (while only with respect to those issues for which the record is closed, these include A10, the only NEPA issue) and having independently considered the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken, the Board has determined that insofar as the health effects and cost-benefit issues covered by this Partial Initial Decision are concerned, a full-term, full-power operating license for Unit 1 should be issued.

254. With regard to the safety issues covered in this Partial Initial Decision, the Board concludes that the application

for operating license and the record of the proceeding contain sufficient information, and that the review of the application by the Staff has been adequate to support the following finding:

255. The Board concludes that to the extent the matters resolved herein implicate the ultimate findings required in the regulations,in accordance with the provisions of 10 C.F.R. §50.57 and 10 C.F.R. §2.760a:

(1) There is reasonable assurance that construction of the facility will be substantially completed, on a timely basis, in conformity with the construction permit and the application as amended, the provisions of the Act and the rules and regulations of the Commission;

(2) There is reasonable assurance that the facility will operate in conformity with the application as amended, the provisions of the Act, and the rules and regulations of the Commission;

(3) There is reasonable assurance (i) that the activities authorized by the operating license can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

(4) SCE&G is technically qualified and the Applicants are financially qualified to engage in the activities to be authorized by the operating license in accordance with the Commission's regulations;

(5) The issuance of the license will not be inimical to the health and safety of the public.

256. Having considered and decided all matters in controversy among the parties related to operation and for which the record in this proceeding is closed, the Director of Nuclear Reactor Regulation will be authorized to make such additional findings on uncontested issues as may be necessary for issuance of a full-term operating license for V.C. Summer Nuclear Station, Unit 1, if the issues remaining open are resolved by this Board in favor of licensing.

ORDER

257. In accordance with Sections 2.754, 2.760, 2.762 and 2.764 of the Commission's Rules of Practice, 10 C.F.R. Part 2, that this Partial Initial Decision shall be effective immediately but subject to the provisions of 10 C.F.R. 2.764 and shall constitute the final action of the Commission regarding the issues decided at the time provided by the

regulations, subject to any review pursuant to the Rules of Practice. Exceptions to this Partial Initial Decision may be filed by any party within ten (10) days after service of this Partial Initial Decision. A brief in support of the exceptions shall be filed within thirty (30) days thereafter, forty (40) days in the case of the Regulatory Staff. Within thirty (30) days after service of the brief of appellant (forty [40] days in the case of the Regulatory Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

THE ATOMIC SAFETY AND
LICENSING BOARD

Gustave A. Linenberger, Administrative
Law Judge
Dr. Frank F. Hooper, Administrative
Law Judge
Herbert Grossman, Esq., Administrative
Law Judge and Chairman

Dated at Bethesda, Maryland

this _____ day of_____, 1981.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:

SOUTH CAROLINA ELECTRIC & GAS COMPANY and	)	Docket No. 50-395 OL
SOUTH CAROLINA PUBLIC SERVICE AUTHORITY	)	
(Virgil C. Summer Nuclear Station)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicants' Proposed Findings of Fact and Conclusions of Law in the Form of a Partial Initial Decision" in the above captioned matter, were served upon the following persons by deposit in the United States mail, first class postage prepaid this 17th day of August, 1981.

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