ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

November 15, 1972

Honorable James R. Schlesinger
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: REPORT ON VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1

Dear Dr. Schlesinger:

At its 151st meeting, November 9-11, 1972, the Advisory Committee on Reactor Safeguards completed its review of the application of the South Carolina Electric and Gas Company for a permit to construct the Virgil C. Summer Nuclear Station, Unit 1. This project had been considered previously at the Committee's 149th meeting, September 14-16, 1972, at the Special Meeting of the Committee, October 26-28, 1972, and at Subcommittee meetings held near the plant site on September 8, 1972, and in Washington, D. C. on October 6, 1972. During its review, the Committee had the benefit of discussions with representatives of the South Carolina Electric and Gas Company, the Westinghouse Electric Corporation, the AEC Regulatory Staff, and their consultants. The Committee also had the benefit of the documents listed below.

The plant will be located in a sparsely populated region in Fairfield County, South Carolina, about 26 miles northwest of Columbia (population, 113,000). The minimum distance to the exclusion area boundary is 5347 ft (1630 m) and the low population zone radius has been selected to be three miles.

The plant will employ a 3-loop Westinghouse pressurized water reactor, to be operated at power levels up to 2775 MW(t). The nuclear steam supply system, including the reactor, is similar to other 3-loop Westinghouse systems on which the Committee has reported recently, but with slightly higher reactor power, coolant flow rate, and coolant temperature. The Committee believes that appropriate additional evidence regarding core behavior will be obtained from reactors of similar design prior to operation of the plant.

The plant will be constructed adjacent to a reservoir of approximately 6,800 acres (Lake Monticello) which will be created by constructing a series of earthen dams across Frees Creek. Lake Monticello will store water for a pumped storage facility and provide cooling water for the nuclear plant. A service water pond constructed within the reservoir is impounded by Seismic Category I dams and will function as an ultimate shutdown or post-LOCA heat sink in the event of loss of water from the reservoir. The Committee believes that particular attention should be given to the design of the service water pond dams to assure an adequate ultimate heat sink in the event that an earthquake leads to loss of Lake Monticello.

The applicant plans to design the Virgil C. Summer Station to withstand a bedrock acceleration of 0.15 g for the Safe Shutdown Earthquake (SSE) and an acceleration of 0.10 g for the Operating Basis Earthquake (OBE). The Committee finds these accelerations acceptable for this plant.

In order to satisfy requirements with regard to efficacy of the emergency core cooling systems for this reactor, the applicant proposes to limit the maximum permissible linear power by reducing peaking factors. The applicant described an experimental and analytical program intended to provide improved understanding of phenomena entering into the loss-of-coolant accident, and which can provide the basis for developing improvements in ECCS design. The Committee believes it important that improvements in ECCS effectiveness be included in the Summer plant, and recommends that the final design of the Summer ECCS be reviewed by the Regulatory Staff and the ACRS prior to fabrication and installation of major components.

Although the applicant does not propose to install a fixed in-core flux monitoring system, he stated that it would be possible to install such a system; the Committee believes this capability should be retained.

The turbine-generator for this plant is so arranged that in the unlikely event of a turbine failure, missiles could be generated which might damage the reactor building or other key structures related to safety of the plant. The Committee recommends that a study be made of the probability of unacceptable consequences arising from potential turbine missiles and of the possible need for protective measures if this probability should be unacceptably high. In addition, the Committee believes that analytical and experimental work on the penetration of reinforced concrete by missiles of the type of interest is desirable to provide a suitable basis for establishing the probability of penetration of thick-walled concrete structures and damage to safety-related components.

The Committee believes that protection against pipe whip should be provided by the applicant in accordance with criteria being developed by the AEC Regulatory Staff.

The applicant has proposed criteria for means to mitigate the consequences of a possible main steamline rupture inside the auxiliary building. This matter should be resolved to the satisfaction of the Regulatory Staff; the Committee wishes to be kept informed.

The fuel rod problem involving densification and subsequent movement of the fuel pellets is undergoing intensive investigation. The Regulatory Staff and the ACRS should review the resolution of this matter as it relates to the Summer plant.

Further studies are in progress with regard to the effects of a failure to scram on anticipated transients and of design features which would make tolerable the results of such an event. These studies should be expedited and the matter resolved during construction in a manner satisfactory to the Regulatory Staff and the ACRS.

Other problems related to large water-cooled and moderated reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee believes that resolution of these items should apply equally to the Virgil C. Summer Nuclear Station.

The Committee, while noting that the applicant refers to programs for verification of design and equipment capability, believes that a more active participation by the applicant would expedite the resolution of generic items relating to safety of light-water reactors.

The Committee believes that the items mentioned above can be resolved during construction and that, if due consideration is given to these items, the Virgil C. Summer Nuclear Station, Unit 1 can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public.

Additional remarks by Dr. David Okrent are presented below.

Sincerely yours,

C. P. Siess

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Chairman

References Attached.

Additional Remarks by D. Okrent

Significant uncertainties exist concerning the probable cause of the major 1886 Charleston earthquake, and the ACRS has received conflicting opinions regarding the probability that a major related earthquake might occur closer to the applicant's site. Several geologic and seismic experts recommended that use of a higher Safe Shutdown Earthquake bedrock acceleration of 0.2 g would be prudent unless the applicant can confirm by field studies his theory that the Yamacraw ridge is a fault responsible for the 1886 Charleston earthquake and that there are no structures which might lead to extension of the Charleston earthquake activity toward the site, or confirm the existence of some other source of the Charleston earthquake which permits the same conclusion with regard to the Summer site. I agree with these recommendations.

References

1. South Carolina Electric and Gas Company letter dated June 30, 1971; Application for Licenses; Preliminary Safety Analysis Report (PSAR), Volumes I through VI

2. Amendments 1, 3-14, 16 and 17 to PSAR

3. Safety Evaluation by Directorate of Licensing, dated August 29, 1972