UNITED STATES NUCLEAR REGULATORY COMMISSION

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1

ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT

9/17/84

ENVIRONMENTAL ASSESSMENT

Identification of Proposed Action: The NRC is considering a proposed license amendment which would permit the increase in the licensed spent fuel storage capacity from 682 spent fuel assemblies to 1276 spent fuel assemblies for the V. C. Summer spent fuel pool. This would extend the full core discharge capability for the V. C. Summer facility from the year 1993 to the year 2008.

The Need for the Proposed Action: Disposal of V. C. Summer spent nuclear fuel is scheduled to be carried out by the Department of Energy in or after 1998 in accordance with Public Law 97-425; Nuclear Waste Policy Act of 1982. As V. C. Summer spent fuel may not be accorded a high priority under the DOE program, the licensee is seeking to provide a spent fuel storage capacity to support approximately twenty-five years of nominal operation. No other contractual arrangements exist for the interim storage or reprocessing of spent fuel from V. C. Summer Nuclear Station. The fuel discharge schedule indicates that with the high density spent fuel racks, loss of full core discharge capability (FCDC) will occur in 2008.

Alternatives to Increased Spent Fuel Storage: Alternatives to the proposed increase of onsite spent fuel storage have been considered. These alternatives are as follows:

- Shipment of fuel to a reprocessing or independent spent fuel storage/disposal facility

  No commercial spent fuel reprocessing facilities are presently

operating in the United States. The licensee has made contractual arrangements whereby spent nuclear fuel and/or high level nuclear waste will be accepted and disposed of by the U.S. Department of Energy; but such services are not expected to be available before 1998. The V. C. Summer Nuclear Station existing spent fuel storage capacity will not provide full core discharge capability beyond 1993. Spent fuel acceptance and disposal by the Department of Energy is not, therefore, an alternative to increased on-site pool storage capacity for the period before 1998 at the earliest.

° Not operating the plant after the current spent fuel storage capacity is exhausted

As indicated in NUREG-0575, "Final Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel," the replacement of nuclear power by coal-generating capacity would cause excess mortality to rise from 0.59-1.70 to 15-120 per year for 0.8 GWY(e). Based on these facts, not operating the plant or shutting down the plant after exhaustion of spent fuel discharge capacity are not viable alternatives to high density storage in the spent fuel pool. The prospective 1983 expenditure of approximately $1.4 million for the high density racks is small compared to the estimated value of replacement power equivalent to the plant's energy output; approximaterly $9 million per month in 1983 and between $18.1 and $22.7 million per month in 1990-1991.

Occupational Radiation Exposures: The staff has evaluated the radiation protection aspects of the licensee's plans to modify the spent fuel pool.

The spent fuel pool at Summer has never been used to store irradiated fuel assemblies and contains only a minimal amount of contamination. Radiation levels have been measured at three (3) depths within the pool and a maximum exposure rate of 0.5 mR/hr has been detected at the bottom of the pool. Because of the low exposure rates, personnel exposure from the rerack operations is expected to be minimal. However, the licensee has taken measures to ensure that personnel exposures to divers working in the spent fuel pool are ALARA. These measures include:

(1) Reviewing all procedures for removing and installing the racks with the diving contractor,

(2) All work will be done under the radiation work permit (RWP) program to ensure that doses are ALARA,

(3) All divers will be issued personnel dosimetry and any doses received will be carefully monitored,

(4) Vacuums will be used to clean the floors of the spent fuel pool after the removal of the old racks.

The licensee does not expect any significant increase in radiation levels due to the buildup of radioactive crud along the side of the pool. If crud buildup eventually becomes a major contributor to pool radiation levels, measures will be taken to reduce such exposure rates. The purification system for the pool includes filters and demineralizers to remove crud and will be operating during the modification of the pool.

The licensee performed a three-dimensional shielding analysis on the spent fuel pool assuming the pool is filled to capacity with the proposed storage densification arrangement. This analysis shows that radiation exposure rates will be less than 1 mR/hr on the outside of the pool walls and at the pool surface from the stored spent fuel. This radiation level meets the V. C. Summer

design radiation zoning for the fuel handling building. The shielding analysis was performed using the shielding codes recommended by the NRC staff in NUREG-0800 and therefore, is acceptable.

SCE&G has presented the following plans for the removal and disposal of the existing racks. The present racks will be unbolted and removed from the pool by divers and using a temporarily installed crane. The old racks will receive an initial high pressure water spray in the decontamination pit to remove the majority of the surface contamination. The exposure rate from this surface contamination is estimated to be less than 2 mR/hr while the radiation level of the racks is estimated to be 0.5 mR/hr. The racks will be temporarily stored in the fuel handling building. SCE&G is considering several options for removing the racks which include: contractor removal, in-house decontamination and disposal, and in-house decontamination and storage on site for possible future use. The staff will monitor the final disposals of these racks.

Based on our review of the Summer SFP modification description and relevant experience from other operating reactors that have performed similar modifications, the staff concludes that the licensee's modification can be performed within the limits of 10 CFR Part 20 and in a manner that will maintain doses to workers ALARA.

We have estimated the increment in occupational dose during normal operations. after the pool modification, resulting from the proposed increase in stored fuel assemblies. The spent fuel assemblies contribute a negligible amount to dose rates in the pool area because of the depth of water shielding the fuel; the major source of exposure is the radionuclide concentrations in the pool water. The most significant contributor to the radionuclides is the

movement of fuel rather than the number of fuel assemblies in the pool. Thus the additional assemblies will add a negligible amount to area dose rates. Based on present and projected operations in the spent fuel pool area and experience from similar modifications, we estimate that the proposed modification should add less than one percent to the total annual occupational radiation dose to plant personnel. The small increase in radiation dose should not affect the licensee's ability to maintain individual occupational doses within the limits of 10 CFR Part 20, and ALARA.

Radioactive Waste Treatment Systems: The plant contains waste treatment systems designed to collect and process the gaseous, liquid and solid waste that might contain radioactive material. The waste treatment systems are evaluated in the Final Environmental Statement (FES) dated May 1981. There will be no change in the waste treatment systems described in the FES because of the proposed modification.

Radioactive Material Released to the Atmosphere: With respect to releases of gaseous materials to the atmosphere, the only radioactive gas of significance which could be attributable to storing additional fuel assemblies for a longer period of time would be the noble gas radionuclide Krypton-85 (Kr-85). Experience has demonstrated that after spent fuel has decayed 4 to 6 months, there is no longer a significant release of fission products, including Kr-85, from stored fuel containing cladding defects. An average of 70 fuel assemblies are expected to be stored following each refueling. Since space must be reserved to accommodate a complete reactor core unloading operation (157 fuel assemblies), the useful pool capacity is 1119 fuel assemblies. For the Virgil C. Summer

Station, one full core storage capability will be maintained until after the sixteenth refueling cycle estimated for Spring 2008. Up to this date, the oldest spent fuel will have been stored for approximately 24 years.

We assumed that all of the Kr-85 that is going to leak from defective fuel is going to do so in the interval between refuelings. The assumption is conservative and maximizes the amount of Kr-85 to be released. Our calculations show that the maximum expected release of Kr-85 from one refueling cycle (70 assemblies) is approximately 86.7 curies. Accordingly, the enlarged capacity of the pool has no significant effect on the greatest release rate of Kr-85 to the atmosphere each year. Thus, we conclude that the proposed modifications will have insignificant effect on offsite exposures.

Iodine-131 releases from spent fuel assemblies to the SFP water will not be significantly increased because of the expansion of the fuel storage capacity since the Iodine-131 inventory in the fuel will decay to negligible levels between refuelings for each unit.

Most of the tritium in the SFP water results from activation of boron and lithium in the primary coolant and this will not be affected by the proposed changes. A relatively small amount of tritium is contributed during reactor operation by fissioning of reactor fuel and subsequent diffusion of tritium through the fuel and the Zircaloy cladding. Tritium release from the fuel essentially all occurs while the fuel is hot, that is, during operations and, to a limited extent, shortly after shutdown. Thus, expanding SFP capacity will not increase the tritium activity in the SFP.

Storing additional spent fuel assemblies is not expected to increase the bulk water temperature during normal refuelings above the 150°F used in the

design analysis. Therefore, it is not expected that there will be significant change in the annual release of tritium or iodine as a result of the proposed modifications from that previously evaluated in the FES.

Solid Radioactive Waste: The concentration of radionuclides in the pool water is controlled by the filters and the demineralizer and by decay of short-lived isotopes. The activity is highest during refueling operations when reactor coolant water is introduced into the pool, and decreases as the pool water is processed through filters and demineralizer. The increase of radioactivity, if any, due to the proposed modification, should be minor because of the capability of the cleanup system to continuously remove radioactivity in the SFP water to acceptable levels.

The licensee states that the amount of solid waste expected to be generated by the spent fuel pool cleanup system is approximately 54 cubic feet per year. The licensee does not expect that this SFP modification will result in any significant increase in this amount of solid waste generated from the spent fuel pool cleanup system. We agree with the licensee and note that should there be an increase in spent fuel pool resin waste generation, the total would still be within those values estimated in the FES.

The present spent fuel racks have not been exposed to spent fuel and, consequently, are only minimally contaminated. Removal and disposal of these existing racks will have minor radiological impact. The disposition of these racks has not been determined by the licensee. However, should the present racks be shipped to an ultimate burial site, the additional quantity of solid waste is not expected to be environmentally burdensome.

Radioactive Material Released to Receiving Waters: Since the SFP cooling and cleanup system operates as a closed system, only water originating from cleanup of SFP floors and resin sluice water need be considered as potential sources of radioactivity.

It is expected that neither the quantity nor activity of the floor cleanup water will change as a result of this modification. The SFP demineralizer resin removes soluble radioactive material from the SFP water. These resins are periodically sluiced with water to the spent resin storage tank. The amount of radioactivity on the SFP demineralizer resin may increase slightly due to the additional spent fuel in the pool, but the soluble radioactive material would be retained on the resins. If any radioactive material is transferred from the spent resin to the sluice water, it will be removed by processing through the liquid radwaste system. Therefore, because of the liquid waste processing system that captures radioactive material, it is not expected that any additional radioactivity in liquid form will be released to the environment resulting from the proposed modification.

Non-Radiological Effluents: The only non-radiological discharge altered by the fuel pool modification is the waste heat. After ten years out of the reactor the rate of heat generation of the fuel is small. After shutdown, radioactive decay within the fuel continues to produce some heat. The rate of heat generation from within the fuel assemblies decreases approximately exponentially after reactor shutdown, decreasing significantly in the first few days. Although heat will continue to be released by the older fuel, the maximum design basis heat load (16.1×10^6 Btu/hr) for the expanded fuel pool, when full, will be within about six percent of the design basis heat load for the

fuel pool when full as currently configured. The small contribution of heat of the older spent fuel assemblies as described above will be negligible in comparison to the total rate of heat discharge from the V. C. Summer Nuclear Station to the Monticello Reservoir. The total station heat discharge rate will be essentially unchanged from about 6.7×10^9 Btu/hr.

There will be no effect on the chemical quality of discharges to the Monticello Reservoir. Increasing the storage capacity of the pool will not result in any change in chemical usage or discharge. No changes will be needed in the NPDES Permit or in any other EPA or state certificates.

Cask Drop Accident: The spent fuel cask will not be lifted more than 30 ft. above an unyielding surface (except over the flooded cask loading pit which is effectively equivalent to a 30 ft. drop in air) during the entire transfer operation under normal operating conditions. On this basis, no radiological release is anticipated from such a drop, and, therefore, no doses need be evaluated.

Fuel Handling Accident: For a fuel handling accident, it is assumed that a fuel assembly is dropped by the refueling crane into the reactor core or spent fuel pool. The staff's review indicates that the proposed spent fuel pool modification does not increase radiological consequences of fuel handling accidents considered in the staff Safety Evaluation Report of February 1981, since this accident would still result in, at most, release of the gap activity of one fuel assembly due to the limitation on available impact kinetic energy.

Alternative Use of Resources: This action does not involve the use of resources not previously considered in connection with the Nuclear Regulatory Commission's Final Environmental Statements dated January 1973 and May 1981 related to this facility.

Agencies & Persons Consulted: The NRC staff reviewed the licensee's request and did not consult other agencies or persons.

Finding of No Significant Impact: Based upon the foregoing environmental assessment, we conclude that the proposed license amendment to increase the storage capacity of the spent fuel pool will not have a significant effect on the quality of the human environment. The Commission has, therefore, determined not to prepare an environmental impact statement for the proposed license amendment.

For further details with respect to this action, see the request for amendment dated January 23, 1984, as supplemented March 6, April 4 & 17, May 11, 18 & 30, July 10 & 31 (two letters), and August 8 & 17, 1984, which is available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D. C., and at the Fairfield County Library, Garden and Washington Streets, Winnsboro, South Carolina 29810.

Dated at Bethesda, Maryland, this 17th day of September 1984.

FOR THE NUCLEAR REGULATORY COMMISSION

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