DETAILED STATEMENT ON THE ENVIRONMENTAL CONSIDERATIONS

BY THE

U.S. ATOMIC ENERGY COMMISSION

RELATED TO THE PROPOSED ISSUANCE OF AN OPERATING LICENSE

TO THE DUKE POWER COMPANY

FOR THE OCONEE NUCLEAR STATION

DOCKET NOS. 50-269, 50-270, AND 50-287

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FOREWORD

This Detailed Statement on Environmental Considerations associated with the proposed issuance of an operating license to the Duke Power Company for its Oconee Nuclear Station has been prepared by the U.S. Atomic Energy Commission pursuant to the requirements of the Commission's statement of general policy (10 CFR 50, Appendix D) concerning the implementation of the National Environmental Policy Act of 1969 (NEPA) which was enacted on January 1, 1970. Copies of the applicant's environmental report were made available for comment by applicable Federal, State and local agencies in August 1970.

Notice of the AEC's intent to issue an operating license for Oconee Nuclear Station was published in the Federal Register on January 8, 1971 (36 F.R. 296).

This final detailed statement takes into account the applicant's environmental report for Oconee Nuclear Station dated July 10, 1970 (Appendix A); the comments received from Federal and State agencies regarding the applicant's report (Appendices C through H, J and K); additional information furnished to the AEC by the applicant (Appendices I, L and M); information contained in the Safety Analysis Report furnished with the applicant's application for an operating license, and the AEC regulatory staff's Safety Evaluation.

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Appendices

1.0 Introduction

By application dated November 28, 1966 and 24 amendments thereto (the application), the Duke Power Company (the applicant) requested a license to construct and operate three pressurized water reactors, identified as Units 1, 2, and 3 at its Oconee Nuclear Station in eastern Oconee County, South Carolina. The application is available for public inspection at the AEC's Public Document Room at 1717 H Street, N.W., Washington, D.C. The application also has been forwarded to the appropriate South Carolina State and local officials.

A safety review of the material submitted in support of the application for a construction permit for Units 1, 2, and 3 was performed by the Atomic Energy Commission regulatory staff and the Commission's independent Advisory Committee on Reactor Safeguards (ACRS), both of which concluded that there is reasonable assurance that the facility could be constructed and operated at the proposed site without undue risk to the health and safety of the public. After publication of a 30-day notice in the Federal Register on July 27, 1967 (32 F.R. 10996) a public hearing was scheduled to consider issuance of a provisional construction permit for the three Oconee Units. Following a public hearing before an Atomic Safety and Licensing Board in Walhalla, South Carolina on August 29-30, 1967, and September 12, 1967, the Director of Reactor Licensing issued Provisional Construction Permits CPPR-33, CPPR-34, and CPPR-35 for Units 1, 2, and 3, respectively, on November 6, 1967.

On June 2, 1969 the applicant filed, as Amendment 7, the Final Safety Analysis Report (FSAR) required by Section 50.34(b) of Chapter 10 of the Code of Federal Regulations as a prerequisite to obtaining an operating license for each unit. The AEC Division of Reactor Licensing and the ACRS independently reviewed the FSAR, as amended, and considered all three units of the Oconee plant. At present, the construction of Unit 1 is sufficiently complete to warrant consideration of an operating license. Units 2 and 3 are in earlier stages of construction. The Safety Evaluation by the Division of Reactor Licensing is dated December 29, 1970. The ACRS review statement is dated September 23, 1970, and is appended to the Safety Evaluation. The AEC notice of its intent to issue an operating license for Oconee Unit 1 was published in the Federal Register on January 8, 1971, (36 F.R. 296).

On July 10, 1970, the applicant submitted an environmental report for the Oconee Nuclear Station. A copy of this report was transmitted to the Governor of South Carolina on August 3, 1970. A notice of availability of the document along with a request for comments from appropriate State and local agencies was published in the Federal Register

on July 25, 1970 (35 F.R. 12032). In addition, copies of the report were transmitted, with a request for comments within 30 days, to those applicable Federal agencies listed in the Council on Environmental Quality's memorandum of July 29, 1970, namely, the Department of Agriculture, the Department of Commerce, the Department of Defense, the Department of Health, Education, and Welfare, the Department of Housing and Urban Development, the Department of the Interior, the Department of Transportation, and the Federal Power Commission.

The AEC Regulatory Staff has received comments from the Governor of South Carolina along with those submitted by the appropriate State agencies; copies of these comments are attached as Appendices H and K. The copies of the comments submitted by the Federal agencies are shown as Appendices C through G, and J. Copies of the applicant's response to the State and Federal comments are attached in Appendices I, L and M.

In accordance with the Commission's regulations, any operating license issued for Oconee Nuclear Station will contain a condition to the effect that:

> The applicants shall observe such standards and requirements for the protection of the environment as are validly imposed pursuant to authority established under Federal and State law and as are determined by the Commission to be applicable to the facility covered by this operating license. This condition does not apply to (a) radiological effects since such effects are dealt with in other provisions of this operating license or (b) matters of water quality covered by section 21(b) of the Federal Water Pollution Control Act.

In addition to the above condition, the Commission's regulations provide that each operating license will contain a condition to the effect that the licensee shall comply with all applicable requirements of section 21(b) of the Federal Water Pollution Control Act.

2.0 The Oconee Nuclear Station

2.1 Site Location

The Oconee Nuclear Station site is located in eastern Oconee County in South Carolina approximately 8 miles northeast of Seneca, South Carolina. Immediately north and west of the site is the Duke Power Company's 18,372 acre Lake Keowee having a shore line of roughly 300 miles. Lake Keowee itself is an impoundment formed by the Keowee and Little River Dams. The dams are located several miles upstream of the juncture of the Little River with the Keowee River

which eventually flows into the Hartwell Reservoir. The Hartwell Reservoir, a U.S. Government-owned lake, lies approximately 4 miles south of the site.

The Oconee Nuclear Station is an integral part of the Keowee-Toxaway Project which includes hydroelectric, pumped-storage, and nuclear power generation facilities. The entire Project lies at the meeting of the Piedmont Hills and the Southern Blue Ridge Mountains in Oconee and Pickens County, South Carolina, and Transylvania County, North Carolina, and along the Keowee River and its tributaries. As ultimately planned, the Project will include two major lakes, the Keowee and the Jocassee, and several small reservoirs in high mountain saddles with an electrical generating capacity of about 10,000 megawatts (MWe). Initial power developments totaling 3,400 megawatts will include the Oconee Nuclear Station, (2658 MWe from its three pressurized water type nuclear units) the Keowee hydro-station (140 MWe) located at the Keowee dam site, and the Jocassee pumped storage hydro-station, (610 MWe) located at the Jocassee dam site. The Jocassee Dam is approximately 11 miles north of the Oconee Nuclear Station and impounds Lake Jocassee which will eventually have a 7,565 acre surface area and a shoreline of roughly 75 miles. In addition to the lake and the reservoirs discussed, the applicant owns approximately 150,000 acres of land in and adjacent to the Project. The bulk of the property outside of the lake lies in the sectors between north by northwest and northeast from the Oconee station.

The general area is characterized by a relatively sparse population on a present and projected basis. Within the exclusion area defined by a 1-mile radius are two bachelor quarters occupied by Duke personnel. These quarters are being used on a temporary basis until construction of the Oconee Nuclear Station is completed. The boundary of the low population zone (LPZ) lies at a 6-mile radius around the site. Population projections indicate that the total population within the LPZ will be approximately 8900 by the year 2010. There are only six population centers over 25,000 people within a 100 mile radius of the site. Anderson, South Carolina, with a 1960 population of 41,316 is the nearest and is located 21 miles south by southeast of the Oconee site. The closest town is Seneca (population 5,227 by 1960 population statistics) located 8 miles northeast of the site.

Most of the land in the Project vicinity is under full forestry management with some cultivation and pasturage. The Duke Power Company indicates that the property will be used for controlled public hunting, fishing, camping, tourism and recreation in cooperation with State agencies and conservation groups. During summer recreation seasons, an estimated transient population of 19,000 people by the year 2010 will have the opportunity to use the above mentioned facilities. All

property within a one-mile exclusion radius of the Oconee Nuclear Station is owned by the applicant except for a small rural church and church plot of some 4.6 acres (these are of historical value and will not be used for regular services), highway rights-of-way, and approximately 9.8 acres of the Hartwell property.

2.2 Description of the Oconee Nuclear Station

The Oconee Nuclear Station will utilize three essentially identical steam turbine power units each of which utilizes a pressurized water reactor steam supply system. Babcock and Wilcox is responsible for the design, the manufacture, and the delivery to the site of the three complete nuclear steam supply systems and nuclear fuel, as well as technical direction of erection and consultation for initial fuel loading, testing, and initial startup of each nuclear steam supply system. General Electric Company is supplying the steam turbine generator for each unit. The applicant, in addition to being responsible for all other aspects of construction, is also responsible for the coordination, scheduling, and administrative direction of the power station once it becomes operational. The Bechtel Corporation is serving as a general consultant to the applicant to provide such engineering assistance as needed during the design and construction of the station.

The three units are identical except for certain auxiliary systems which are shared. The Oconee units are generally similar to those of other current pressurized water reactors. Each nuclear reactor will utilize slightly enriched uranium dioxide fuel sealed in zircaloy tubes. Site parameters, principal structures, engineered safety features and accidents are all evaluated for a unit output of 2584 MWt consisting of 2568 Mwt core output plus 16 MWt from the reactor coolant pumps.

The concentration of boric acid dissolved in the primary coolant water is one of two means of obtaining reactivity control. Reactivity control also is provided by the movement of control rods (which contain Ag-In-Cd absorber material clad in stainless steel) within the fuel assembly.

An electrically heated pressurizer controls the primary reactor coolant pressure and provides a surge chamber to accommodate reactor volume changes during operation. Reactor coolant pumps circulate the water through the reactor vessel and core. The primary coolant system operates at 2,185 psig with a reactor inlet temperature of 554°F and outlet temperature of 604°F. The heated reactor coolant is pumped through the tube side of two steam generators. On the shell side of the steam generators feedwater from the condensers of the turbine generator is converted to low pressure (910 psig) steam at about 566°F

temperature. The steam drives the turbine generator (producing electrical power), passes through condensers and, as feed water at about 460°F, is returned to the steam generator for reuse.

For each unit, the reactor vessel is surrounded by reinforced concrete shielding (primary shield), beyond the vessel the reactor coolant pumps, steam generators, and pressurizer are surrounded by another reinforced concrete shield (secondary shield) all within the reactor building (third shield). The reactor building is a prestressed, post-tensioned, concrete structure with a leak tight steel-liner. The combination of the primary and secondary shielding, and the reactor building shield is expected to limit the radiation level outside the reactor building to less than 0.5 mrem/hr at full power operation. A common fuel handling building and storage pool for both fresh and spent fuel jointly serves Unit 1 and 2 and is located between the two reactor buildings. Unit 3 has a separate and independent fuel handling building and storage pool. The reactor building provides the means to contain radioactive fission products that may leak from the coolant system. The purification system, decay heat removal system, and waste disposal system tanks are housed in a separate auxiliary building (one for Units 1 and 2, and another for Unit 3). A single turbine building is located adjacent to the auxiliary buildings and houses three General Electric turbine-generators (one per Unit) and support equipment for the associated steam, feedwater, and condensate systems.

3.0 Requirements of the National Environmental Policy Act

The discussion in remaining sections of this statement takes into account the applicant's environmental report and the comments made by the various Federal Agencies according to the following environmental factors specified in section 102(2)(C) of the National Environmental Policy Act of 1969:

a. the environmental impact of the proposed action,

b. any adverse environmental effects which cannot be avoided should the proposal be implemented,

c. alternatives to the proposed action,

d. the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

e. any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Additional detail on each of these items is contained in the applicant's environmental report.

4.0 Environmental Impact of the Proposed Action

The principal environmental effects that have been associated with nuclear power facilities are potential radiological effects and thermal effects of the heated condenser cooling water discharge. Protection against radiation is, of course, considered fully in the AEC licensing process. With respect to water quality, the applicant has received a discharge permit from the South Carolina Board of Health and Pollution Control Authority, and indicates that it will comply with applicable water quality standards. To a lesser degree, there are also other environmental effects associated with the nuclear power facilities such as those involving fish and wildlife, sewage disposal, aesthetics, and recreation. These and other effects are discussed below.

4.1 Radioactive Discharges

The operation of any nuclear reactor results in the production of radioactive materials which for the most part are contained within the fuel elements in the reactor vessel. The radioactive materials are produced as a direct result of the fission process or as a result of the neutron activation of materials in the reactor core or the coolant. Small quantities of gaseous and liquid radioactive wastes may be released to the environment by controlled processes following appropriate monitoring procedures, treatment, and sampling. The AEC regulations that set the maximum allowable limits for release of radioactive material are set forth in 10 CFR Part 20, as amended, and apply to the site on which the facility is located. If more than one unit is located at a site (as is the case here, i.e., Oconee Units 1, 2 and 3), the effluents from each facility must be such that the combined releases remain within the limits specified in the regulations.

The limits on radioactive gaseous and liquid effluents from the Oconee Nuclear Station have been established and will appear in the Technical Specifications for each unit. The limits therein conform to the applicable requirements set forth in 10 CFR Part 20, as amended. The technical specifications will require that the expected releases of radioactive material in effluents will be kept at small fractions of the limits specified in 10 CFR Part 20, as amended. In addition, in accordance with the Commission's regulations (10 CFR Part 50, 35 F.R. 18385), the applicant shall be required to keep levels of radioactive material in effluents to unrestricted areas as low as practicable. The applicant also is required to submit a report

at the end of each 6-month period of operation indicating the quantities of radioactive material released to the environment.

The vast bulk of the radioactive waste material produced during the operation of the three units will be safely contained in the fuel elements. After the fuel is depleted, these fuel assemblies will be removed from the reactor core and, after allowing for decay of some of the fission-product activity by storage in the spent fuel pool, the fuel elements will be shipped in Federally approved shipping casks for eventual reprocessing.

The relatively small quantities of radioactive waste material generated by the units and not retained in the fuel will be treated by special radioactive waste handling facilities at the station. The radwaste treatment systems incorporated into the facility and the corresponding waste disposal practices planned are described in section 9.0 of the AEC Safety Evaluation (Appendix O). These facilities will reduce the radioactivity in both the air and water discharges from the Oconee Station to a level that will be a small fraction of those specified by the AEC in 10 CFR Part 20, as amended. A continual environmental radioactivity monitoring program will be conducted by the applicant with back-up environmental monitoring by the South Carolina Board of Health and reviewed by the U.S. AEC.

4.1.1 Liquid Radwaste System

Processes for liquid radwastes include holdup, filtration, mixed-bed demineralization, and evaporative separation. By means of these methods, the volume of radioactive waste will be greatly reduced and the purified liquid stream will be reused or discharged. Small quantities of radioactive liquid waste will be released routinely on a batch basis to the Keowee Hydro Station tailrace where the liquid waste will be diluted and discharged to the Keowee River. As a result of frequent operation of the onsite hydro-station, almost all liquid waste releases are expected to be mixed in a dilution flow substantially greater than the minimum 30 cubic feet per second dilution flow that would be available if the hydro-station is not operating. In all cases, prior to release to the tailrace, the applicant is required to analyze liquid wastes to determine gross and/or isotopic activity concentrations to assure that the releases do not exceed 10 CFR Part 20, as amended. Gross activity is also monitored during release with release automatically terminated if activity exceeds a safe level.

As stated above, the limits of these releases from the three units will require that the combined releases from the three units be within the limit specified in 10 CFR Part 20. The applicant has

estimated in Table I the maximum activity concentrations in the station effluent for three units, each operating with 1% defective fuel.

According to Table I, the applicant's estimated maximum yearly average concentration in the Keowee Hydro Station tailrace discharge during reactor operation will be a total of about 23.7 percent of the maximum permissible concentrations. In reference to this figure, the applicant in a letter to the AEC dated October 30, 1970 (Appendix M) states the following:

> "This table presents the results of calculations of the maximum activity in the station effluent for the three Oconee reactor units, assuming that each was operating with one percent defective fuel for a period of one year. This one percent defective fuel condition is a design assumption that was used in specifying and sizing the radioactive waste disposal systems. This table is not intended to represent the normal or expected operating conditions. Thus the figure of 23.7 percent of MPC should be interpreted as a figure of merit. It demonstrates the ability of the radioactive liquid waste system to handle an extreme condition which is assumed to exist simultaneously in all three reactor units, without exceeding a small percentage of the permissible limits."
>
> "The radioactive liquid waste system has provisions for hold-up of liquid intake for decay of radioactivity, for treatment by ion exchange and evaporation to reduce the activity even further and for controlled, monitored release in accordance with AEC regulation 10 CFR Part 20. Further, the Technical Specifications for the Oconee Nuclear Station list additional requirements for processing all waste to reduce the radioactivity to as low a level as practicable within the limits of 10 CFR Part 20."
>
> "Therefore, because of the over-sized radioactive waste systems that have been provided in the design of the Oconee Nuclear Station and the regulatory requirements for controlling and measuring these effluents, the releases from the three units during normal operation should total less than one percent of the maximum permissible limits, both on a short term and on an annual basis."
>
> "The environmental radioactivity monitoring program samples, from the upper reaches of the Hartwell Reservoir and from the Clemson and the Anderson water supply intakes, will confirm that this degree of control has been achieved during station operation."

The major amount of activity expected to be released to the environment from a pressurized water reactor is tritium in the form of tritiated water. The source of tritium is the neutron activation of the boron used in the chemical shim and of any trace amounts of lithium in the primary coolant.

Table I*

Maximum Activity Concentrations in the Station Effluent
for Three Units, Each Operating with One Percent Defective Fuel

Liquid Waste

Operation	Yearly Average Concentration in Tailrace Discharge, Fraction of MPC
Lifetime Shim Bleed Including Startup Expansion and Dilution	0.077
Discharge of Miscellaneous Wastes	0.16

Gaseous Wastes

Operation	Yearly Average Concentration at Site Boundary, Fraction of MPC
Lifetime Shim Bleed	0.058
Startup Expansion and Dilution	0.18
Venting of Letdown Storage Tank	0.015
Venting of Pressurizer	0.011
Reactor Building Purge	0.11
Steam Generator Tube Leakage of 1 gpm in one unit	0.089

* Prepared by the Duke Power Company (FSAR, Section 11).

4.1.2 Gaseous Radwaste System

For the Oconee pressurized water reactors, the gaseous rad waste system includes the capability for a 60-day holdup, filtration with a 90% removal efficiency for iodine prior to release to the unit vent. In reference to the values for gaseous wastes in Table I, a description of the methods for calculation of the yearly average concentrations at the site boundary is given in the FSAR, Section 11.1.2.5.2. Thus, advantage is taken of both holdup and charcoal and particulate filtering systems.

4.1.3 Solid Radwaste Treatment

Radioactive solid wastes collected in the form of paper, spent resins, trash, etc. will be kept separate from non-radioactive wastes and placed in Federally approved shipping containers. Upon collection of sufficient solid radioactive wastes, the containers will be shipped offsite for ultimate disposal at an AEC licensed disposal site.

4.1.4 Federal and State Comments

The U.S. Public Health Service of the Department of Health, Education, and Welfare was sent a copy of the applicant's "Environmental Statement." The report prepared by HEW (Appendix F) contained the following comments regarding radioactive waste handling.

> "All three units of the facility are typical of pressurized water reactors of current design and contain the best waste systems available when the design was finalized. Radioactivity discharges are expected to be low and of minimal health risk as indicated by our recent studies. The environmental statement should, however, contain a commitment by the company to use all waste system in such a way that discharges will be kept as low as practicable."

As indicated earlier, the applicant is required by the Commission's regulations to keep levels of radioactive materials in effluents to unrestricted areas as low as practicable. In addition, in response to HEW's comment, the applicant has stated (Appendix L):

> "As a matter for inclusion in Technical Specifications, we have committed to use the liquid and gaseous waste handling systems in such a way that quantities of radioactive materials released in combined effluents from the three units will be kept as low as practicable and a very small fraction of the limits of 10 CFR 20."

Section 9.0 of the AEC Safety Evaluation report dated December 29, 1970 (Appendix O), discusses the control of radioactive effluents and the Technical Specifications will include the specific limits of both liquid and gaseous effluents. Under normal operating conditions, however, it is expected that liquid waste releases will contain radioactivity in concentrations that are less than 1% of the 10 CFR Part 20 limits and that the concentrations in the gaseous releases will be only a few percent of the 10 CFR Part 20 limits.

Another comment made by HEW was that:

> "Although the Company has developed an emergency plan and included the health department in its notification list, we would like to see a clearer recognition by the Company that the State is the only agency that can initiate protective actions in the offsite area and of the Company's commitment to assist the State in this regard by immediate notification of all incidents, by providing source monitoring data, and by monitoring of offsite areas."

The applicant has replied to this comment as follows:

> "They (HEW) suggest that we clearly recognize that the State Health Department is the only agency that can initiate certain actions and that we recognize our commitment to assist this state agency. This relationship and our firm commitment to fully cooperate with the State Health Department is fully recognized in our Emergency Plan developed in cooperation with the State Health Department and other state and local agencies."

Copies of the applicant's emergency plans have been sent to the South Carolina State Board of Health, the AEC Emergency Radiological Monitoring Team, and other participating outside emergency units. The AEC Safety Evaluation report also comments on the engineered safety features of the power plants and discusses emergency planning for dealing with incidents that might involve releases of radioactivity (see Appendix O). From this the AEC concludes that the applicant's emergency plan conforms to the requirements for emergency plans as presented in the proposed change to 10 CFR Part 50.34 of the Commission's regulations and is acceptable.

HEW further comments as follows:

> "The gaseous discharge limit for the facility should consider the multiple units and should be applied in such a way to avoid additive effects that would exceed recommended guides at the nearest point of residence. If some valid justification exists for not considering the location of this residence, then it should be presented for critical review and analysis."

In reply, the applicant states the following:

> "They (HEW) suggest that the gaseous discharge limits consider the multiple units and expressed concern about the leased residence within the site boundary. As indicated in No. 1 above, we will operate the waste treatment facilities to limit releases considering the combined effect of all three units. The occupants of the leased residence were the former owners of that house, and the terms of the lease permitted their occupancy except when their removal from the site was in the interest of health and safety as determined by Duke Power. They voluntarily vacated the residence. By revision 8 to the FSAR (Amendment 16 to application), at the bottom of page 2-1 dated 7/23/70, we advised that the residence would be removed. Subsequently, the house has been destroyed by fire and will not be replaced."

4.1.5 Radiological Monitoring in the Environment

The principal requirements for the applicant's environmental radiation monitoring program are listed in the Technical Specifications. The applicant also describes the environmental radioactivity monitoring program including preoperational and operation programs in the FSAR, Section 2. In the FSAR, the applicant states that the results of the environmental monitoring program will be compared with published information from the national radiological surveillance programs reported by the U. S. Public Health Service (now in the Environmental Protection Agency) and with environmental monitoring reports of other nuclear installations in the area.

The applicant provided preoperational environmental monitoring data obtained from a program initiated in January 1969. These data provide information on the background radioactivity in the Oconee Nuclear Station area prior to plant startup and the AEC has concluded that they provide acceptable reference data for the continuing environmental radiation monitoring program. The preoperational program included

analyses of samples of water, airborne particulates, rain, settled dust, silt (river and lake), terrestrial vegetation, aquatic vegetation, algae and plankton, fish, milk, and animals. No anomalies in environmental radiation levels have been indicated by the preoperational data thus far reported.

The operational environmental monitoring program will be expanded to include two additional onsite air monitoring stations, a continuous water sampling station on the Keowee River, and a thermoluminescent dosimeter network within the exclusion radius.

The Fish and Wildlife Service of the U. S. Department of the Interior also has reviewed the applicant's program and its recommendations have been considered in developing the applicant's environmental radiation monitoring program. The report of the Fish and Wildlife Service is attached as Appendix J. The AEC has concluded that the applicant's program will be adequate for monitoring the radiological effects of plant operation on the environs and for assessing the effects of releases of radioactivity to the environment from operation of the plant on the health and safety of the public.

On the basis of the type and size of equipment provided to control effluent releases, and general experience with currently licensed and operating power reactors, there is reasonable assurance that the radioactive waste treatment system will perform as designed and that the radioactivity levels in liquid or gaseous releases from the Oconee Nuclear Station will be well below the levels specified in the Commission's regulations, 10 CFR Parts 20 and 50, and the Technical Specifications set forth in the operating license. Exposures to the public from radioactivity in effluents released from the Oconee site are not likely to exceed a few percent of exposures from natural background radiation. The extensive environmental monitoring program to be carried out by the licensee will assure that information and environmental levels of radioactivity are developed on a continuing basis.

4.2 Water Quality Aspects

4.2.1 Legislation

Section 21(b) of the Federal Water Pollution Control Act, as amended by the Water Quality Improvement Act of 1970 (WQIA), generally requires applicants for Federal licenses or permits to conduct any activity, including the operation of a facility such as a nuclear power plant, which may result in any discharge into the navigable waters of the United States, to provide the Federal licensing agency with certification from the State, or interstate water pollution control agency, or

the Administrator of the Environmental Protection Agency,* as appropriate, that there is reasonable assurance, as determined by such certifying authority, that the activity will be conducted in a manner which will not violate applicable water quality standards. Oconee Nuclear Station will discharge effluent into the Keowee River arm of Lake Keowee. The matter of whether this body of water is part of the navigable waters of the United States, and whether the facility is therefore subject to the provisions of section 21(b), is still under review. At this time a certification from the appropriate state agency has not been issued but the applicant has received a discharge permit dated November 19, 1970, from the South Carolina Board of Health and Pollution Control Authority (see Appendix N). However, if section 21(b) is applicable, section 21(b)(7) of the Act provides that where actual construction of the facility had lawfully commenced prior to the date of enactment of the Water Quality Improvement Act of 1970, the certification shall not be required for three years from the date of enactment of the WQIA, except that any such license or permit so issued without certification shall terminate at the end of three years, unless, prior to that time, certification is provided. The construction of Oconee Nuclear Station had begun before April 3, 1970, and therefore a certification is not required before April 3, 1973. The applicant has stated its intention to abide by applicable water quality standards. If section 21(b) is not applicable, then, under the Commission's statement of general policy on the implementation of NEPA, state certification of compliance with applicable water quality standards would be dispositive as to this aspect of effects on the environment.

4.2.2 Thermal Effects

4.2.2.1 Background Information

All steam-electric generating plants, either nuclear- or fossil-fueled, release heat to the environment as an inevitable consequence of producing electric power. Heat generated from the fission of nuclear fuel in a reactor is used in the case of the Oconee reactor to heat pressurized water within the reactor core region of the primary coolant loop. The secondary loop is maintained at a sufficiently low pressure enabling superheated steam to be generated within the steam generator [illegible] through the

*WQIA originally placed the responsibility with the Secretary of the Interior. However, Reorganization Plan No. 4 of 1970 which became effective on December 2, 1970, transferred these functions to the Administrator of the Environmental Protection Agency.

turbine its temperature and pressure drops as a consequence of imparting roughly one-third of its energy to the turbine-generator. The "spent" steam leaves the turbine and passes through another heat exchanger, called the condenser, in which it is condensed for eventual return to the steam generator where the whole cycle repeats itself. Within the condenser nominally two-thirds of the original energy generated within the reactor and transferred to the secondary loop must now be dissipated to cooling water.

4.2.2.2 Condenser Circulating Water System

As noted above, cooling water is withdrawn from the Little River branch of Lake Keowee, circulated through the steam turbine condensers, and returned to the Keowee River arm of the lake. According to the applicant, the maximum temperature of the Oconee Station cooling water will not exceed 93.2°F beyond the established mixing zone, and will meet the water quality standards of the State of South Carolina.

In passing through the Oconee Nuclear Station condensers at full power operation, the cooling water temperature is expected to increase approximately 17.6°F. The Oconee Station will withdraw water from the bottom of the Little River arm of Lake Keowee under a skimmer wall across the intake canal some 70 feet below the normal water surface level and return it to the Keowee branch of the lake at the shoreline some 30 feet below the normal surface level at a discharge velocity of 4.4 ft/sec. A similar intake and discharge scheme has been successfully operated since 1965 at the applicant's Marshall Station on Lake Norman. The deep water intake offers several environmental advantages. First, during summer stratification it allows the Oconee Station to use the normally cooler hypolimnetic waters which after being incrementally heated in the plant can be discharged back to the lake near or slightly below the naturally occurring summer temperature of the lake surface. In this way temperature disparities between the plant discharge water and the receiving lake water can be avoided. Secondly, this scheme minimizes the possibility of recirculation between the cooling water intake and discharge points. Thirdly, the hypolimnetic waters are expected to be biologically less fertile during the stratification periods thereby decreasing the probability of plant intake of biota. Lastly, by withdrawing water from the hypolimnetic regions and returning it to the surface layers of the lake reaeration of these waters becomes enhanced.

During the months when Lake Keowee is homothermal the heated effluent from the Oconee Station will be buoyant; buoyancy forces and turbulent diffusion will float and spread the heated effluent above the cooler

receiving waters and the heated effluent will have an opportunity to dissipate its heat to the atmosphere. Should the heated effluent be more dense than the receiving water at the point of discharge, it will sink into the thermocline region for later thermal dissipation to the atmosphere during the fall turn-over period.

In many instances where water is withdrawn, heated, then discharged into a receiving body of water, there may be valid concern whether there could be direct or indirect harm to the aquatic environment resulting from the mechanical or thermal stresses imposed by such a process. The thermal stress is not only on the condenser cooling water itself, but also on the receiving water since the receiving water in the neighborhood of the outfall mixes with the heated effluent and thereby increases its own temperature. The extent to which the receiving water increases its temperature and the actual zone of thermal influence within the receiving water depends upon many factors such as the heated effluent exit velocity, the shape and position of the discharge point, the topography of the discharge location, the turbulent mixing characteristics of the receiving water and others.

For many years the applicant has used man-made hydro reservoirs for sources of cooling water for steam-electric facilities. To date, 22 steam-electric generating units on these man-made lakes have been utilized with incremental condenser temperature increases comparable to the Oconee Units and the applicant indicates that it has noticed no adverse effects on the ecology of these lakes. The applicant has an established Water Resources Research Department consisting of full time field and laboratory personnel looking into such matters. Using the combined expertise and experience of this group together with the help of outside professional consultants, the cooling water aspects of the Oconee Station were designed to either eliminate or minimize possible adverse thermal effects. In its comments, the South Carolina Pollution Control Authority requested clarification of this use of term "adverse." The applicant responded that long-term empirical observations since 1926 have shown no evidence of any fish kills due to thermal discharges within the service area with plants having cooling water temperature conditions similar to those to be experienced by the Oconee condensers.

The Pollution Control Authority also requested information concerning the effects of heated discharges on any microorganisms which might be present. The applicant responded that it was working in cooperation with John Hopkins University and several local universities and State agencies to investigate thermal influences on aquatic organisms within Lake Norman as influenced by the Marshall steam-electric station in North Carolina. The applicant indicates that to date the studies,

although they have not been completed, do not reveal significant reductions in species, composition, or diversity.

The U.S. Department of the Interior questioned whether the information submitted by the applicant was sufficiently complete in that it did not address the thermal impact of the Oconee Station downstream of Lake Keowee. It further questioned whether the early studies performed by the applicant's consultants for the Federal Power Commission were sufficiently thorough to address the entire Keowee-Toxaway Project and its contemplated steam electric facilities. In response, the applicant stated that the work performed by its consultants in 1966 considered only a 3000 megawatt nuclear plant at the Oconee site. It is also pointed out that under present licensing considerations, any future stations would have to be independently licensed, and therefore should not be considered in the present deliberations. The possibility of downstream thermal effects were not directly discussed by the applicant; however, it is known that, as a result of the various investigations performed by the applicant, a submerged weir was constructed upstream of the Keowee hydro intake. This weir, similar to one in service elsewhere, is expected to retard the cool hypolimnetic waters in the summer and release surface oxygen rich waters in the interest of downstream water quality.

The Department of the Interior further questioned whether chemicals were to be used for condenser cleaning and asked what facilities were being used to prevent the mechanical and/or thermal destruction or damage of fish or other aquatic organisms drawn to or passing through the cooling water intake. The applicant stated that the condenser tubes will be cleaned mechanically without the use of chemicals. In response to the question of prevention of biota uptake and possible subsequential damage after passing through the condenser cooling system, the applicant stated that the intake at Oconee was designed with conservative low water velocities which have proven successful at other installations on similar lakes in preventing damage to fish. The applicant stated that the normal cooling water intake velocity for the entire Oconee Plant consisting of three units would be approximately 0.45 ft/sec, and that 3/8 inch wire mesh screening is expected to provide the necessary fish protection at the intake.

4.2.2.3 Cooling Water Alternatives

Cooling towers were considered as an alternate to using Lake Keowee as a direct source for cooling water for the Oconee plant The applicant has addressed this issue on page 2 of his environmental statement (Appendix A) and in its response to the Department of the Interior's letter of September 28, 1970, (Appendix J). The applicant stated

(Appendix M, Statement 3) that "The alternative to Keowee-Toxaway Project was thermal stations with cooling towers but without Lake Keowee as a cooling reservoir. The development of Lake Keowee substantially increases the population of fish and other aquatic organisms which would not have occurred had the alternative been selected." In other words, Lake Keowee would not have been constructed in the first place had it not been expected that Lake Keowee could be used for once-through cooling purposes for the Oconee Plant.

4.2.2.4 Cooling Water Environmental Studies

The applicant's environmental studies program is mentioned on pages 4, 5 and 8 of its environmental report (Appendix A) and in its response to the Department of the Interior's letter (Appendix M, Statement 5). As already has been indicated, the applicant has established a full-time department consisting of administrative, laboratory and field personnel to conduct research on its hydro-lakes. The ongoing research is supplemented by work from a number of professional limnologists and aquatic biologists. The applicant also has been conducting studies in the form of engineering calculations of simulated models to forecast limnological, hydraulic, and thermal behavior for the larger thermal stations. When these plants go into service, field tests will be made by the applicant to compare results with predicted behavior and to serve as a further basis for developing future thermal plants.

4.3 Economic and Environmental Amenities

4.3.1 Economic Amenities

In its comments on the applic.nt's environmental report, the Federal Power Commission (Appendix C) has indicated the urgent need for the generating capacity of the Oconee Station not only for the applicant's service area, but also because of the power reliability it can bring to the larger area serviced by the Virginia-Carolinas Reliability Group, a utility power pool to which the applicant belongs. The economic impact of the Oconee Station can not, therefore, be measured only on a localized basis. In this respect the applicant stated that long-range plans for residential, commercial and industrial development within the Keowee-Toxaway Project are being coordinated with the planning agencies of the two counties in which it is located. The Department of Housing and Urban Development (Appendix E) questioned the advisability of such restricted planning activities. The applicant responded (Appendix L) by stating that from the initial stages of development the entire project was coordinated with the Appalachian Regional Commission in Washington, with the South Carolina Appalachian Advisory Commission in Greenville, and with the U.S. Corps of Engineers in Charleston.

The applicant also has stated in its environmental report that the Keowee-Toxaway project will involve a total expenditure of over one-half billion dollars in private monies in Appalachia which is about half of the commitment called for in the Federal Appalachian Regional Development Program. The applicant states that this commitment of economic activity, spurred by a range of activities from tourism to taxes paid on the investor-owned project, is expected to be very substantial. The South Carolina State Development Board has essentially supported the applicant's economic projections, and was in favor of granting the applicant permission to operate the Keowee-Toxaway power generating stations providing that the applicant will operate the Project without significant damage to the environment as indicated by the applicant's past performance.

4.3.2 Environmental Amenities

The Oconee Station and the entire Keowee-Toxaway Project is a complementary electrical power generation and resource development. Electric power provides the basic economic justification; however, other improvements and amenities not contributing to the economic justification are being integrated into the Project such as downstream flow augmentation during periods of drought, soil conservation, forestry, flood control, public water supply, wildlife preservation and propagation, education, fisheries resources and recreation. These amenities as well as others are elaborated upon on in the applicant's environmental report, as follows:

Downstream Flow Augmentation -

During low stream flow periods the applicant will release stored water from its lakes to augment the government power generation and navigation flows in the Savannah River. The value of these headwater benefits is substantial. In addition, the dams constructed for the Project have a freeboard of 15 feet over normal lake elevation which will provide for temporary surcharge storage to reduce the downstream effects of major floods which may occur.

Public Water Supplies -

The Town of Seneca, South Carolina is presently using and will continue to use Lake Keowee as a public water supply without charge. It is expected that as area water needs grow, additional water supplies will be provided by the Project.

Conservation -

To retain topsoil, to provide soil storage of rain, and to prevent rapid run-off, all of the applicant's land in the watershed around Lakes Keowee and Jocassee have been placed under forest management. Yields from saw timber and pulpwood have born the cost of the forestry program. The South Carolina State Commission of Forestry (Appendix H) has commented that it has been their observation during the past 30 years that the applicant has attempted to manage their woodlands for multiple-use purposes including high value forest products, and that it appears that the applicant has incorporated this multiple-use concept in its environmental quality program for the Project.

The applicant also has discovered and preserved a 15-acre virgin stand of trees indigenous to the Appalachian Mountains. This acreage has been named the Coon Branch Natural Area and has been registered with the Society of American Foresters as a scientific natural area.

Fish and Wildlife -

The applicant has donated the use of over 100,000 acres of the Project watershed lands to South Carolina Wildlife Resources Department and the North Carolina Wildlife Resources Commission for game and fish propagation and management purposes. Lake Keowee already has been stocked with fingerlings. Eventually controlled public hunting also will be allowed within certain areas of the site.

Recreation -

The South Carolina Department of Parks, Recreation and Tourism has been deeded a 1000 acre tract of land on Lake Keowee with the intent of creating a new State park. In addition, eight recreational areas are being constructed around Lake Keowee and three around Lake Jocassee. These areas range in size from 21 acres involving launching areas and parking facilities to a 155-acre tract that will include campgrounds, picnic areas, sanitary facilities, bathhouses, boat storage facilities and marinas. A wilderness campground is being developed, accessible only by hiking trail or water. Special care has been taken to preserve areas of scenic beauty and to make these areas more accessible to the public. Twenty five miles of right-of-way has been offered to the state for future development of a scenic highway through the high ridge overlooking the Project.

Education -

The applicant has constructed a visitor center which consists of a visiting room containing a scale model of the entire project, several exhibit chambers depicting the story of man's development and utilization of energy resources, and an auditorium. Since completed in July 1969, the facility has hosted more than 250,000 visitors, many of which are students on regularly scheduled tours from vicinity schools. In addition faculty members of five surrounding universities have been engaged in research activities or consulting studies in relation to the Project.

5.0 Alternatives to the Proposed Action

5.1 Electrical Energy Requirements

The Federal Power Commission (FPC) in its review of the applicant's environmental report in Appendix C has commented upon the electrical energy requirements in the applicant's service area. The FPC points out the following information:

> "The 1970 summer peak load on the Duke Power Company's system is expected to reach 6,390 megawatts. During the following winter season a peak load of 6,398 megawatts is expected. Between the summer of 1970 and the winter of 1973-1974 the Company's summer and winter peak loads are expected to grow to 8,390 megawatts and 8,405 megawatts respectively, an average annual growth per year of 9.5 percent. To provide for this anticipated increase, the Company is planning a number of additions to installed generating capacity in addition to the three nuclear units at the Oconee Power Station. In 1973 the Company expects to have available 7,364 megawatts of installed capacity, not including the three units of the Oconee Nuclear Power Plant, one of which is planned to be in service each year beginning in 1971. Thus, it is evident that the Company will suffer a deficiency of installed capacity of more than 1,000 megawatts, if the scheduled units of the Oconee Nuclear Plant are not available to serve the 1973 peak load. There is no doubt, therefore, of the need for the generating capacity which would be made available by the three nuclear units of this power plant."

The FPC also indicates that the Virginia-Carolinas Reliability Group utility pool, of which the applicant is a member, also needs the timely addition of the generating capacity of the Oconee Station so that reserve margins within this pool can be sustained at 15 to 20 percent. Anything below this percentage is considered detrimental to reliability of electric supply of any operating pool. In summation the FPC states:

> "On the basis of anticipated loads and scheduled additions to generating capacity, it is evident that the Oconee Nuclear Units are needed not only by the Duke Power Company's system alone but also by the Virginia-Carolinas Reliability Group."

5.1.1 The Fossil Fuel Plant Alternate

The FPC also indicates that severe shortages of domestic supplies of natural gas and coal and continuing world shortages of low-sulfur residual fuel oil limit the applicant in having sufficient supplies of fossil fuel for such power plants. While this situation will eventually clear up with an improvement in the economics of mining coal, the current coal shortage is likely to extend to 1973 and beyond. The FPC thus states as follows:

> "If this should prove to be the case, a coal-fired substitute for the Oconee Nuclear Power Plant might not be able to deliver its rated capacity when needed."

The FPC goes on to state:

> "Any fossil fuel plant as an alternative to the nuclear Oconee Plant would necessarily add to the particulate or gaseous burden of the South Carolina atmosphere. At the present time all of the steam-generating stations of the Duke Power Company depend on coal as the principal fuel. This coal comes from Virginia, West Virginia, Tennessee and Kentucky mines, and has a sulfur content in the range of 0.5 to 1.5 percent, and on an annual basis averages 1.0 percent. Since low-sulfur coal is increasingly difficult to obtain and low-sulfur oil is virtually unavailable, the planning of the Oconee Power Plant as a nuclear facility offers important environmental advantages with respect to air quality in the State of South Carolina."

5.1.2 Hydro Plant Alternate

The FPC also has addressed the alternate possibilities of hydro power within the applicant's service area:

"A hydroelectric installation as a substitute for a nuclear Oconee Power Plant must be ruled out as a practical consideration because of the lack of a site with a potential high enough to satisfy the requirements of the Company and the Virginia-Carolinas Reliability Group. Moreover, the lack of time between the present and the appearance of the 1973 loads for construction for such an installation and the stream flows in the region which limit any hydroelectric installation, conventional or pumped storage, to service as a peaking facility, are factors which mitigate against such a substitution."

5.1.3 Power Import Alternate

The alternative of importing power from other members within the applicant's power pool or from other surrounding pools or utilities does not appear to be feasible. This has been discussed by the FPC as follows:

"This conclusion is based on a review of the present load-capacity situations of the surrounding utility systems and operating pools from which imported power would have to come. At the present time the Pennsylvania-New Jersey-Maryland Interconnection to the north is operating under a narrow reserve margin of 8.3 percent. The Southern Company's systems to the south are in a more precarious situation with only 7.7 percent reserves. To the west the Tennessee Valley Authority's system has a reserve margin of 13.1 percent and to the northwest the American Electric Power's systems have a reserve margin of 16.8 percent. In each of these outlying areas, the reserve margins are such that none of the systems is in a position to export large blocks of power on a firm basis. Because of the trend to larger generating units and the problems associated with plant siting and transmission line routing, it is unlikely that the reserve situation in 1973 will differ to any extent from that of 1970. Thus, the power supply situation would hardly be improved in the time available even if the Duke Power Company departed from generally accepted utility practice of relying principally on construction of its own generating capacity to provide for its own loads and sought to buy power from others instead of completing the construction of the Oconee Nuclear Units.

"Even if time were available for new construction, these neighboring systems and operating pools would be hard put

under the present conditions of popular environmental concern, to find the sites for plants whose principal purposes would be to export power to distant utility systems. These systems in common with utility systems everywhere are having difficulties in timely construction of new capacity to improve their own unsatisfactory reserve margins. Even though it is highly desirable to have a strong transmission network interconnecting regions for purposes of improved diversity and reserve backup, such interconnections together with out-of-the-area generation would not lessen the overall impact of facilities on the environment."

"It is evident, therefore, that if the Duke Power Company and the Virginia-Carolinas Reliability Group are to meet expected loads in 1973, reliance cannot be placed on the import of required firm power from neighboring systems and pools to the north, south or west as a substitute for the proposed Oconee Nuclear Power Plant."

5.1.4 Power Mix

In January 1965, the applicant applied to the Federal Power Commission for a license to construct the Keowee Hydroelectric Station, to utilize the Keowee reservoir as a source of cooling water for three large thermal plant sites, and to build the Jocassee Hydroelectric Station. These three purposes were essential to the economic justification of the project, and the applicant made it clear that it could not undertake the project at all unless the license covered the two initial hydroelectric stations and use of Lake Keowee as cooling water for the first thermal plant site. In planning the Keowee-Toxaway Project, several combinations of generation types were considered and analyzed by highly complex techniques of simulated dispatch. By examining a variety of expansion patterns through simulation of incremental cost dispatching hour-by-hour for many years into the future (including a number of systems effects such as spinning reserve, maintenance requirements, etc.), the combination of capacity types that would result in lowest system generation costs was identified. The optimum mix of generation types for initial development at Keowee-Toxaway involved generating units with a range of capacity factor characteristics. Oconee Nuclear Station is the base load thermal capacity, Jocassee is the medium-capacity-factor pumped-storage plant, and Keowee plus some of Jocassee's capacity supported by streamflow represents the peaking hydro capacity.

5.1.5 Alternate to Keowee-Toxaway Project

The applicant has stated that the alternatives to Keowee-Toxaway Project would have been a high-head pumped-storage project elsewhere in the Southern Blue Ridge Mountains on Company land to develop 750 mw of peaking capacity plus a large thermal plant located on an unimpounded river in the Company's service area with cooling water to be recirculated through several large cooling towers. During the FPC licensing proceedings, it was clearly established that the Keowee-Toxaway Project offered advantages of economics and of environmental quality when compared to the alternatives.

6.0 Adverse Environmental Effects

The Keowee-Toxaway Project consisted of constructing two large impoundments - Lakes Keowee and Jocassee. More than 26,000 acres of land were inundated in this process and no doubt this land was used as a natural habitat for wildlife and other living species. The inundation by Lake Keowee also resulted in the flooding of points of archeological interest - the sites of Ft. Prince George and old Keoweetown.

The applicant, however, has donated the use of over 100,000 acres of its land within the Project watershed to the South Carolina Wildlife Resources Department and the North Carolina Wildlife Resources Commission for game propagation and management purposes. As an original part of the FPC license for the Project, the applicant was required to recover any artifacts of archeological interest from the above-mentioned sites. The applicant has complied with the FPC directive, and the artifacts which were recovered are in the possession of state and local museums.

The applicant indicates that the entire Project which includes the Oconee Nuclear Station is a complementary power generation and resource development with no known adverse environmental effects other than those listed above and those temporary inconveniences normally associated with large construction projects.

The applicant has indicated in its PSAR and FSAR and Appendix H that it will comply with all Federal and State regulations applicable to the Oconee Station which are designed to protect the public health and safety and the environment. Furthermore, the applicant has stated that if any adverse effects attributable to the operation of Units 1, 2 and/or 3 were to become evident, through the environmental monitoring programs during plant operation, appropriate steps would be taken by the applicant to correct the situation.

7.0 Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The local short-term effects on the environment are those associated with the thermal and radiation discharges of Oconee Units 1, 2, and 3. The discharge of condenser cooling water will be kept well within the applicable water quality standards, and the plant's liquid and gaseous radioactive effluents are calculated to be within a small percentage of the 10 CFR Part 20 limits. In addition, the applicant is conducting an environmental monitoring program involving field tests to be used to compare results with predicted behavior and to serve as a sound basis for future developments. The applicant's water resources research-group includes the Keowee-Toxaway Project and the upper end of the Hartwell reservoir in its continuing water quality monitoring program. The environmental radiological monitoring program will include sampling and analysis of air, surface and ground water, including river bottoms and lake sediments, terrestrial and aquatic vegetation, fish and animals, and milk. This program will be used to provide a basis for detecting and evaluating any radiological impact which might lead to long-term effects in order that timely corrective action can be taken if required. Long-range planning includes a variety of developments utilizing these water resources as described above along with 150,000 acres of surrounding land. The extensive long-term benefits essentially involve no short-term compromises with the environment other than the displacements and temporary inconveniences normally associated with large construction projects.

8.0 Irreversible and Irretrievable Commitments of Resources

In essence, the use of the Oconee site as a part of the entire Keowee-Toxaway Project was irretrievably committed in 1965 with the beginning of compoundment of the Keowee River and its tributaries, involving irreversible commitment of land resources. The applicant has coordinated the many interrelated Project elements so that the integrated result will maximize the Project objectives, i.e., the construction of the Keowee Hydroelectric Station, the use of the Keowee Lake as a source of cooling water for the three Oconee units, and the building of the Jocassee Hydroelectric Station for production of reliable, low-cost electricity and for enhancing the beneficial effects of the Project upon the environment. Curtailment of the range of beneficial uses of the natural resources of the area as a result of plant construction and operation should be no more severe than the curtailment which is incident to many heavy industrial facilities. The beneficial uses of the surrounding area should not be impaired.

APPENDIX A

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50-270
50-287

DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C.

A. C. THIES
VICE PRESIDENT
PRODUCTION AND OPERATION

P. O. BOX 2178
28201

July 10, 1970

Dr Peter A Morris, Director
Division of Reactor Licensing
U S Atomic Energy Commission
Washington, D C 20545

Dear Dr Morris:

Please refer to your letter of May 6 requesting the submission of information on the environmental impact of the Oconee Nuclear Station. Since Oconee is an integral part of the Keowee-Toxaway Project being concurrently constructed, the environmental aspects of Oconee are inseparable from those of the entire project. The attached report, "Environmental Quality Features of Duke Power Company's Keowee-Toxaway Project," briefly summarizes the environmental aspects of the entire project. These aspects have already been reviewed by the appropriate federal and state agencies, and we are not aware of any problems that have not already been resolved to the satisfaction of the responsible agency. For example, Federal Power Commission license for Project 2232 covers construction of two hydroelectric plants and the use of Lake Keowee as cooling water for Oconee Nuclear Station. The proceedings leading to issuance of that license included review and concurrence by the Department of Interior, the Army Engineers, the South Carolina Pollution Control Authority, the South Carolina Wildlife Resources Department and others. After these reviews, the FPC license was issued in September 1966 thus authorizing Duke to proceed with the project, and we subsequently filed an application for construction permit with you for Oconee Nuclear Station in connection with matters of nuclear safety and environmental radioactivity.

In the attached report, you will find answers to the specific questions in your letter as follows:

a. The report summarizes the environmental impact of the Keowee-Toxaway Project which includes Oconee Nuclear Station as one project element.

b. There are no known adverse environmental effects that will result from the project other than the displacements and temporary inconveniences normally associated with large construction projects. The information on the thermal effects of cooling water and the effects of low level radioactive discharges are summarized in the report beginning on pages 3 and 5 respectively.

c. The alternative to the Keowee-Toxaway Project is outlined in the report beginning on page 2. This alternative would have failed to provide the wide spectrum of environmental enhancements embraced in the Keowee-Toxaway Project.

d. The extensive long term benefits of this project involve no short term compromises with the environment other than the inconveniences referred to in (b) above.

e. Impoundment of the Keowee River and its tributaries represents an irreversible commitment of land resources, and has been licensed and approved by the appropriate agencies.

f. Environmental studies performed and planned are listed on pages 4, 5 and 8 with respect to thermal effects and environmental radioactivity monitoring.

g. The recreational uses of the project are extensive and are summarized on page 5.

h. Pollution control measures included in the project are highlighted on pages 3 and 4 with respect to cooling water, and the top of page 5.

i. The concurrence of the principal state agencies having jurisdiction of environmental matters is summarized beginning on page 8.

The report is necessarily brief. At this late stage in consideration of our application for operating licenses, neither time nor the engagement of personnel on pressing matters has permitted us to include additional details from our voluminous files of environmental considerations that were developed during the conceptual and developmental stages of the Keowee-Toxaway Project.

Yours very truly,

A C Thies

ACT/s

Atta

cc S C Pollution Control Authority - w/encl
S C Wildlife Resources Department - w/encl
Mr Reese Hubbard, County Supervisor
Oconee County, S C - w/encl

ENVIRONMENTAL QUALITY FEATURES
OF
DUKE POWER COMPANY'S
KEOWEE-TOXAWAY PROJECT

July 1970

INTRODUCTION

This report summarizes the environmental quality features of Duke Power's Keowee-Toxaway Project located in northwestern South Carolina and western North Carolina. From its conception and throughout its planning and execution, the project with its many interrelated elements has been considered as an integrated development with the objective of providing reliable, low-cost electric generation and of enhancing its beneficial effects upon the environment. A number of project elements are under the regulatory jurisdictions of a variety of governmental agencies. Licenses, permits, contracts, agreements or understandings have been sought from 61 entities of government. Throughout these proceedings, Duke Power has coordinated the many interrelated project elements so that the integrated result will maximize project objectives.

PROJECT DESCRIPTION

As ultimately planned, the project will include two major lakes, several smaller reservoirs in high mountain saddles, and electric generating capacity of about 10 million kilowatts. Long-range planning includes a variety of developments utilizing these water resources along with 150,000 acres of surrounding land.

The project lies at the meeting of the Piedmont hills and the Southern Blue Ridge Mountains in Oconee and Pickens County, South Carolina and Transylvania County, North Carolina, and along the Keowee River and its tributaries. Initial power developments totaling 3,408,000 kw will include the Keowee Hydro Station, Jocassee Hydro Station with pumped-storage, and the Oconee Nuclear Station. The environmental aspects, as well as the power output and economic justification, of these three developments are interwoven, and do not lend themselves to separate analysis for any one of the power stations.

Lake Keowee, impounded by dams on adjacent rivers, will have a shoreline of 300 miles and 18,400 surface acres. Each of the two dams is of compacted earthfill, and the 140,000 kw Keowee Hydro Station includes two generators with fixed-blade waterwheels served by a common tunnel from a single intake. At the upper end of Lake Keowee, the 385 foot high Jocassee dam is under construction, comprised of compacted rockfill structure with an impervious core. With 310 feet of static head above Lake Keowee, Lake Jocassee will have a surface area of 7565 acres and a shoreline of 75 miles. The Jocassee power-

house will contain four 152.5 mw reversible pumped-turbine units. The first thermal station contemplated for the project is now under construction on the shore of Lake Keowee. Oconee Nuclear Station consists of three units of 886,300 kw each, utilizing pressurized water type reactors. As the initial phases of the project, the Keowee, Jocassee and Oconee developments are all currently under construction with an estimated completion cost of over one-half billion dollars.

Electric power provides the economic justification for the project. With deliberate planning, other improvements are being integrated into the project although they do not contribute to the finite economic justification. Nevertheless, these features have been embraced because of their contribution to the environment and quality of life in the area served, which in the long run is expected to reflect favorably on the Company's business.

ALTERNATIVES TO KEOWEE-TOXAWAY PROJECT

In January 1965, Duke applied to the Federal Power Commission for a license to construct the Keowee Hydroelectric Station, to utilize the Keowee reservoir as a source of cooling water for three large thermal plant sites, and to build the Jocassee Hydroelectric Station. These three purposes were essential to the economic justification of the project, and Duke made it clear that it could not undertake the project at all unless the license covered the two initial hydroelectric stations and use of Lake Keowee as cooling water for the first thermal plant site. After consulting with the Department of Interior, the Army Engineers, the South Carolina Pollution Control Authority, the South Carolina Wildlife Resources Department, and other federal and state agencies, the FPC license was issued and provided for these developments including the use of cooling water at the site where Oconee Nuclear Station is now under construction.

The alternatives to Keowee-Toxaway would be a high-head pumped-storage project elsewhere in the Southern Blue Ridge Mountains on Company land to develop 750 mw of peaking capacity plus a large thermal plant located on an unimpounded river in the Company's service area with cooling water to be recirculated through several large cooling towers. During the FPC licensing proceedings, it was clearly established that the Keowee-Toxaway Project offered advantages of economics and of environmental quality when compared to the alternatives.

ENVIRONMENTAL QUALITY FEATURES

Features designed to minimize adverse impacts and to enhance environmental benefits are summarized as follows:

Cooling Water and Thermal Effects

The original impetus for examining the feasibility of the Keowee-Toxaway Project was as a search for new sources of cooling water for large thermal-electric generating plants needed in South Carolina. For many years, Duke has used its hydro reservoirs as sources of cooling water, being careful to limit the capacity of each steam plant so that the cooling duty was entirely commensurate with the potential of the lake, with the environment, and with other uses of the lakes. Beginning in 1926, Duke has completed 22 steam-electric generating units on man-made lakes utilized as sources of cooling water and to dissipate the waste heat of condensation before recirculation through the condensers. In this period, temperature rises similar to Oconee's have been consistently employed, and no adverse effects on the ecology have been detected. In 1959, Duke established a full time Water Resources Research Department consisting of field and laboratory personnel whose function is to examine the limnological and thermal behavior of its lakes to serve as the basis for making sound site decisions as well as engineering design of future plants. Using the research results developed by this group and consultants, plus the work of others in this field, a thermal regime model of the proposed Lake Keowee was constructed for each month of the year for examination of various combinations of heat dissipation. These studies, using criteria confirmed by field measurements on Duke's existing power lakes in the region, established that Lake Keowee could readily dissipate the heat rejected to the cooling water by 7000 mw of thermal generating capacity distributed among three sites. Two future sites would involve cooling waters from the lake's surface, and the third site, selected for Oconee, would utilize the heat sink of the hypolimnetic waters during the summer. Cooling water for Oconee Nuclear Station will come from the bottom of the lake under a skimmer wall across the intake canal at sufficiently low velocity to prevent disturbing the naturally occurring summer stratification of the lake. This intake water will be of such low temperature that, after the addition of heat in Oconee's condensers, it is returned to the lake near or below the naturally occurring summer temperature of the lake surface. During seasons of highest natural water temperatures, the

cooling water supplies to Oconee being hypolimnetic, are relatively barren biologically. A similar skimmer wall has been in successful service since 1965 at Duke's most recent steam plant on Lake Norman in North Carolina, and its performance confirmed by thermal and biological studies.

During cooler months of mid-October to mid-May when the lake will be isothermal throughout its depth, the warmed discharge water will float on the surface and rapidly dissipate its heat by back-radiation, conduction and evaporation. The temperature will return to its equilibrium level within this dissipation zone and prior to recirculation into the Oconee intake. During these months, the maximum temperature will not exceed the 93.2°F specified in the South Carolina Water Classification Standards. From mid-May until sometime during August in most years, when the discharge water returning to the lake is often cooler than the natural occurring surface, the water will sink below the surface to an intermediate level for later thermal dissipation during the fall mixing period. Again, the discharge temperature will comply with water classification standards. In late summer and up until the advent of fall mixing, the discharge temperature will be at or near the surface temperature and will again remain on the lake surface for dissipation. During extremely warm weather and drawdown of the lake occasioned by low streamflows, the temperature at the point of discharge is expected to be higher than 93.2°F, but will comply with the standards which provide for measurement after an adequate zone for mixing with the receiving waters.

The results of Duke's studies leading to the design of the Oconee cooling water system were reviewed with the South Carolina Pollution Control Authority and the U S Fish and Wildlife Service. To obtain an independent opinion, the Department of Interior retained Dr C J Velz and associates of the University of Michigan to make a separate study. After receiving Dr Velz's report, on April 7, 1966, then Secretary of Interior Stuart Udall wrote the Federal Power Commission concluding that the thermal effects of the proposed nuclear plant would "produce no detrimental effects upon the fishery resources" within Duke's proposed lakes and would not "be deleterious to the recreational resources." As is done at other Duke plants, when Oconee goes into service, field tests will be made to compare results with predicted behavior and to serve as a further basis for developing the two future thermal plants on Lake Keowee.

Downstream Water Quality

Also as a result of the predicted limnological models of Lake Keowee, a submerged weir was constructed upstream of the Keowee hydro intake. This weir, similar to the one in service at a Duke hydro plant since 1963, is expected to retain the cool hypolimnetic waters in the summer and release oxygen rich waters from the surface in the interest of downstream water quality and waste assimilative capacity. Confirmation of the effectiveness of this weir will be a part of the continuing water resources research program.

Release of Water from Storage to Augment Downstream Benefits

By an agreement signed in October 1968 with the U S Army Corps of Engineers and the Southeastern Power Administration of the Department of Interior, during periods of low natural streamflow Duke will release from the lakes stored water to augment the government power generation and navigation flows in the Savannah River downstream.

Environmental Radioactivity

During normal and abnormal operating conditions, the levels of radioactivity in liquid and gaseous effluents from Oconee Nuclear Station will be a small fraction of the permissible limits prescribed by federal regulations for protection of public health and safety. This will be confirmed by a continual environmental radioactivity monitoring program conducted by Duke with back-up environmental monitoring by the South Carolina Board of Health and the U S Atomic Energy Commission. Solid radioactive wastes containing radioactivity will be packaged and shipped to licensed reprocessing or disposal facilities.

Recreation

Keowee-Toxaway is expected to attract extensive recreational use. Eight recreational areas are being constructed around Lake Keowee, and three around Lake Jocassee. These areas range from a 21 acre development with launching ramps and parking areas to a 155 acre complex that will additionally involve campgrounds, picnic areas, complete sanitary facilities and bathhouses, boat storage facilities and marinas. Near the upper end of Lake Jocassee, a wilderness campground is being developed, accessible only by hiking trail or water. Duke has donated 1000 acres of land to South Carolina for development of the Keowee-Toxaway State Park. As recreational use expands in the future, a variety of additional facilities is contemplated.

Soil Conservation

To retain topsoil in place and to provide soil storage of rain and prevent rapid run-off, 150,000 acres of Duke property in the watershed around Lakes Keowee and Jocassee have been placed under scientific forest management for maximum sustained water yield by Duke's professional foresters. The yield from saw timber and pulpwood helps pay the cost of the program including taxes and reforestation.

Preservation of Virgin Timber

In the mountains above Lake Jocassee along the Whitewater River, a 15 acre area was discovered to have a virgin stand of 18 species of trees indigenous to the Appalachian Mountains. Several of the trees are giants of their species, with some Chestnut Oaks measuring close to 5 feet in diameter at a point 4½ feet from the ground. The tract has been named the Coon Branch Natural Area, and its elevation ranges between 2000 and 2700 feet above sea level. Duke has registered this tract with the Society of American Foresters for preservation as a scientific natural area.

Historical Salvage

Prior to their inundation by Lake Keowee, extensive diggings were made for archeological salvage at the sites of Ft Prince George, an early British outpost, and old Keoweetown, headquarters of a part of the lower Cherokee Nation. The recovered artifacts are in possession of state and local museums.

Fishing Resources

Although only partially filled, Lake Keowee has been stocked with fingerlings and already sportsmen attest to the results. Both Lakes Keowee and Jocassee are expected to contribute substantially to the area's sport fishing opportunities.

Wildlife

In 1965, Duke donated the use of over 100,000 acres of Keowee-Toxaway Project watershed lands to the South Carolina Wildlife Resources Department and the North Carolina Wildlife Resources Commission for game propagation and management purposes. Gamefood was planted along the company forestry roads through the area, and the state agencies are building up the game population to support controlled public hunting in selected areas. Already, frequent deer and an occasional wild turkey have been seen by those working on the Jocassee dam.

Public Health

In addition to its mosquito control program, Duke's Department of Public Health and Sanitation works closely with state and county health agencies to establish high quality standards of sanitation that will be applied to all waterfront developments.

Water Supply

Nineteen towns, cities and water districts have been using the other existing Duke reservoirs as their source of water supply without charge, and now the twentieth, the Town of Seneca, South Carolina, has begun withdrawing its public water supply from the partially filled Lake Keowee. As water needs grow, it is expected that increasing and additional water supplies will be provided by the Keowee-Toxaway Project.

Flood Control

The dams have a freeboard above full power pool of 15 feet which provides for temporary surcharge storage to reduce the downstream effect of major floods that may occur.

Education

On a hill overlooking Lake Keowee and the Oconee Nuclear Station is the Keowee-Toxaway Visitors Center completed in July 1969. The center consists of three main parts: a visitor room containing a scale model of the entire project, a series of exhibit chambers telling the story of man's development and use of energy resources, and a large fully equipped auditorium where programs can be tailored to the audience. Although its location is in a remote area far removed from normal travel routes, during its first year of operation 250,000 visitors toured the center. School officials in the surrounding area have adopted the use of the center, and school science classes are now regularly scheduling visits. As indirect support of educational functions, consulting faculty members and research associates representing a wide spectrum of disciplines from five universities have been engaged so far to perform research or consulting studies in direct support of the project. The institutions represented include Clemson University, The University of South Carolina, The University of North Carolina at Chapel Hill, North Carolina State University, and Georgia Institute of Technology.

University faculty members, with Duke's cooperation, are presently contemplating research in beneficial uses of the warm water effluent from Oconee Nuclear Station. Two plans now under consideration are in the areas of fish farming and increased production of horticultural products by warm-water irrigation.

Scenic Beauty

Special care has been taken to preserve areas of scenic beauty, and further to make these areas more accessible to the public. Duke has offered the free use of 25 miles of right-of-way for future development of a scenic highway among the high ridges overlooking the project. Meantime, the use of trails for hikers and campers is now available.

Residential, Commercial and Industrial Development

Long-range plans for such developments are being coordinated with the official planning agencies of the two counties involved so that the future growth of such developments can be encouraged and coordinated by professional planners.

Economic Development

Keowee-Toxaway is located in the Appalachian area. The Appalachian Regional Development Program calls for investment of up to $1 billion in federal seed money to serve as impetus for economic development of the 359 county Appalachian area covering parts of eleven states. Development currently under way as a part of Duke's Keowee-Toxaway Project will result in investment of over one-half billion dollars in private monies in the three Appalachian counties of North and South Carolina in which the project lies. The concomitant economic activity, spurred by a range of activities from tourism to taxes paid on this investor owned project, is expected to be very substantial.

CONCURRENCE OF STATE AGENCIES

In connection with Duke's application to the Federal Power Commission for license to construct the hydroelectric developments and to use Lake Keowee for cooling water, the South Carolina Water Pollution Control Authority transmitted the following resolution to the FPC:

"It was moved, seconded, and passed that

"WHEREAS, the South Carolina Water Pollution Control Authority is an agency of the State of South Carolina established within the State Board of Health for the administration of laws and programs relating to water pollution within the State:

"WHEREAS, Duke Power Company has applied to the Federal Power Commission for a license under the Federal Power Act to construct the Keowee-Toxaway Project located on the Keowee and tributary rivers in Pickens and Oconee Counties, South Carolina;

"AND WHEREAS, Duke Power Company's application for said license indicates that they contemplate provision for maintaining oxygen content of water discharged by the Keowee development during the summer months;

"AND WHEREAS, Duke Power Company, by its program of hydro-electric plant operation and reservoir management, has clearly demonstrated its willingness to fully cooperate with State agencies in areas of water pollution control and public health;

"WHEREAS, the proposed Keowee-Toxaway Project is not expected to have any net detrimental effect upon water pollution and public health in the State of South Carolina, but will make available to adjacent and nearby municipalities an adequate supply of high quality water for the foreseeable future;

"NOW THEREFORE BE IT RESOLVED that the South Carolina Water Pollution Control Authority endorses Duke Power Company's proposed Keowee-Toxaway Project in Pickens and Oconee Counties, South Carolina.

"RESOLVED FURTHER that a copy of this resolution be transmitted to the Secretary, Federal Power Commission, Washington, D C.

"(Resolution as passed by the South Carolina Water Pollution Control Authority in executive session on February 24, 1965.)"

In connection with the licensing of Oconee Nuclear Station, at the public hearing held in Walhalla, South Carolina on August 29, 1967 before the Atomic Safety and Licensing Board, the following testimony was given by Mr William T Linton, Director of the Division of Engineering of the South Carolina Board of Health and also Director of the State Pollution Control Authority:

"Mr Chairman, I am presenting this in the name of Dr E Kenneth Aycock, State Health Officer and Chairman of the Pollution Control Authority, and I would like first to express his regrets at his inability to be here.

"I would like also to add my welcome to those that have been advanced to you gentlemen and to say that South Carolina is extremely pleased and honored to have you here.

"I am reading this as it is written and ask that it be so recorded.

'Mr Chairman, my name is E Kenneth Aycock, M D, State Health Officer and Chairman of the South Carolina Pollution Control Authority. In these capacities, I represent the only legally constituted agencies whose official concerns are for the health of the people of South Carolina and the protection of the environment from waste products discharged into it.

'The purpose of this statement is to acquaint the Atomic Energy Commission and this Board with the knowledge that our agencies support the application by Duke Power Company for licenses to build and operate the nuclear power generating facility known as the Oconee Nuclear Station, Units 1, 2 and 3, in Oconee County, South Carolina.

'We have had many occasions in the past to become acquainted with Duke Power Company in matters pertaining to fossil-fueled generating plants and have found them to be competent and quite cooperative.

'Our staff has had the privilege of associating indirectly with this company in its position as a member of the Carolinas-Virginia Nuclear Power Associates, which has operated the experimental nuclear power plant at Parr, South Carolina for several years.

'During the several years surrounding the construction and operation of the Parr Reactor, our staff conducted, and is conducting, environmental surveys to insure the health and safety of our citizens. Very close cooperation between our staff and the CVNPA staff has always existed, including technical assistance when monitoring equipment became inoperative, the sharing of samples and information and many other evidences of mutual help. This same spirit of cooperation on the part of Duke Power Company has already been demonstrated in this endeavor. Assistance has been pledged in the matter of locating sampling sites during the pre-operational and post-operational phases for

surveillance purposes. All information sought by us has received prompt attention. In short, Duke Power Company has displayed complete willingness to assist our agencies in the discharge of their responsibilities.

'The Safety Analysis Report and Amendments have been analyzed by our staff, as have the comments made by the National Center for Radiological Health of the U S Public Health Service. As a result of these analyses, we see no reason why the operation of the Duke Power Company's Oconee Nuclear Station in the manner specified should contravene any of our requirements.

'Personally, and in our official capacity, it gives us considerable pleasure to say again that we endorse the application for the license being sought by the Duke Power Company.'

"Thank you, Mr Chairman."

The following is quoted from a letter of November 1, 1965, to the Federal Power Commission from Mr James W Webb, Director, Division of Game, S C Wildlife Resources Department:

"Duke Power Company immediately, upon purchase of approximately 68,000 acres of land for development of this project in South Carolina, entered into a cooperative agreement with this Department for the conservation and management of the fish and wildlife resources on this area permitting us to regulate the hunting and fishing on this area and to provide public hunting and fishing on the area. We immediately moved fisheries and wildlife technicians into the area and have been developing the area for public use.

"The construction of the proposed Keowee and Jocassee Lakes will add tremendously to the recreation for the public and will be a terrific attraction to tourists and campers as well as fishermen, boating enthusiasts and sightseers.

"Duke Power Company and our personnel have worked very closely together in drawing up plans for providing access to these waters and we not only approve of the plans for the recreational features planned by Duke Power Company, but our personnel helped in the planning and preparation of these recreational features. This

Department and Duke Power Company have worked closely together in other areas in providing access and recreational features to waters created by their impoundments and I am sure that should there be need for additional recreational features and access points, that we will have no difficulty in obtaining them from Duke Power Company."

CONCLUSIONS

Compared to the alternative developments, the Keowee-Toxaway Project utilizes a man-made lake for dissipation of the waste heat of condensation from a nuclear-electric generating station instead of cooling towers, and offers the following environmental enhancements not found in the alternative: downstream flow augmentation in periods of dry weather, extensive recreational opportunities, soil conservation measures, perservation of virgin timber, recovery of historical information and artifacts, substantial fisheries resources, wildlife preservation and propagation, public water supply, flood control, and opportunities for enjoyment of scenic beauty; along with increased local income opportunities associated directly with the Project's many features.

Publications

Other publications relating to the Keowee-Toxaway Project and its environment are available from Duke Power Company, Box 2178, Charlotte, N C, 28201. They include:

"The Forests & Flowers of Keowee-Toxaway"
"Flowers, Ferns, Shrubs and Trees found at Keowee-Toxaway" by
Dr C Leland Rodgers, Chairman, Dept of Biology, Furman University

"Duke Power - The Environment"
"Keowee-Toxaway"
"The Story of Energy"
"The Keowee-Toxaway Project"
"Lake Keowee Map"

APPENDIX B

(42)

STATE OF SOUTH CAROLINA

Office of The Governor

Columbia 29211

ROBERT E. McNAIR
GOVERNOR

September 17, 1970

Mr. Harold L. Price
Director of Regulation
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Price:

Reference is made to the pending application before the Atomic Energy Commission by Duke Power Company for an operating permit for its Oconee Nuclear Station. Enclosed are comments from State agencies with the authority for establishing and enforcing environmental standards as well as comments from agencies with an interest in this matter.

It is the opinion of the State of South Carolina as represented by these State agencies that the granting of an operating permit to Duke Power Company for its Oconee Nuclear Station by the Atomic Energy Commission will have less adverse environmental effects than its alternatives and urges the granting of that Permit.

Sincerely,

Robert E. McNair

REM:AMB
Enclosures

FEDERAL POWER COMMISSION
WASHINGTON, D.C. 20426

IN REPLY REFER TO:

AUG 20 1970

Honorable Glenn T. Seaborg
Chairman
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Seaborg:

This is in reply to Mr. Price's letter of July 22, 1970, requesting comments of the Federal Power Commission on the environmental impact of the Oconee Nuclear Power Plant Units 1, 2, and 3 of the Duke Power Company.

Although the Federal Power Commission as a general rule does not have licensing jurisdiction over thermal power plants constructed by electric utilities, the Commission's interest in the subject case arises not only from its normal concern with timely construction of generating facilities to meet electrical requirements but also from the fact that the Oconee Units 1, 2, and 3 are to be built on the reservoir of a hydroelectric project pursuant to provisions of a license issued by the Commission September 26, 1966, on the FPC's Licensed Project No. 2503. Thus our comments on factors related to the proposed environmental statement also include reference to those articles of the license dealing with environmental considerations which must be satisfied by the licensee.

Our resulting comments on pertinent factors related to the proposed environmental statement on the Oconee Nuclear Plant are enclosed.

Sincerely,

John N. Nassikas
Chairman

Enclosure
1. Comments on the AEC Environmental Statement

Federal Power Commission
Comments Relative to the Environmental Statement
on the Oconee Nuclear Power Plant of the Duke
Power Company, Units 1, 2 and 3

The Need for Power

The 1970 summer peak load on the Duke Power Company's system is expected to reach 6,390 megawatts. During the following winter season a peak load of 6,398 megawatts is expected. Between the summer of 1970 and the winter of 1973-1974 the Company's summer and winter peak loads are expected to grow to 8,390 megawatts and 8,405 megawatts respectively, an average annual growth per year of 9.5 percent. To provide for this anticipated increase, the Company is planning a number of additions to installed generating capacity in addition to the three nuclear units at the Oconee Power Station. In 1973 the Company expects to have available 7,364 megawatts of installed capacity, not including the three units of the Oconee Nuclear Power Plant, one of which is planned to be in service each year beginning in 1971. Thus, it is evident that the Company will suffer a deficiency of installed capacity of more than 1,000 megawatts, if the scheduled units of the Oconee Nuclear Plant are not available to serve the 1973 peak load. There is no doubt, therefore, of the need for the generating capacity which would be made available by the three nuclear units of this power plant.

The same conclusion is supported by an analysis of the available data regarding the old CARVA pool which consisted of Duke Power Company, Virginia Electric and Power Company, Carolina Power and Light Company and the South Carolina Electric and Gas Company. The 1970 summer peak load for this pool was expected to be 16,475 megawatts. By the summer of 1973 this load was expected to increase to 22,123 megawatts. During the three year interval, members of the pool were to add 7,798 megawatts of new capacity in anticipation of the 1973 loads, not including the three nuclear units planned at the Oconee Nuclear Power Plant. These additions to installed capacity would have provided a reserve margin for the pool of 1,941 megawatts, equal to 8.8 percent of expected peak in 1973. This would have been a precariously low reserve margin for an operating pool of the size of the old CARVA pool. If the Oconee units are built as planned the reserve margin in 1973 of the old CARVA pool would have been 4,596 megawatts, a reserve equal to 20.8 percent of expected peak.

The reserve margins of the old CARVA pool are significant because of the current concern for reliability of electric supply in the region. This has resulted in the transformation of the old CARVA pool into the Virginia-Carolinas Reliability Group by the addition of two new members, the Southeastern Power Administration and the South Carolina Public Service Authority. The new group is a member of the newly organized Southeastern Electric Reliability Council.

This coal comes from Virginia, West Virginia, Tennessee and Kentucky mines, and has a sulfur content in the range of 0.5 to 1.5 percent, and on an annual basis averages 1.0 percent. Since low-sulfur coal is increasingly difficult to obtain and low-sulfur oil is virtually unavailable, the planning of the Oconee Power Plant as a nuclear facility offers important environmental advantages with respect to air quality in the State of South Carolina.

Power Imports

The likelihood of substituting purchased firm power from systems or pools bordering upon the Duke Power Company's system or those of the Virginia-Carolinas Reliability Group, as an alternative for the building of the Oconee Nuclear Power Plant does not appear to be feasible.

This conclusion is based on a review of the present load-capacity situations of the surrounding utility systems and operating pools from which imported power would have to come. At the present time the Pennsylvania-New Jersey-Maryland Interconnection to the north is operating under a narrow reserve margin of 8.3 percent. The Southern Company's systems to the south are in a more precarious situation with only 7.7 percent reserves. To the west the Tennessee Valley Authority's system has a reserve margin of 13.1 percent and to the northwest the American Electric Power's systems have a reserve margin of 16.8 percent. In each of these outlying areas, the reserve margins are such that none of the systems is in a position to export large blocks of power on a firm basis. Because of the trend to larger generating units and the problems associated with plant siting and transmission line routing, it is unlikely that the reserve situation in 1973 will differ to any extent from that of 1970. Thus, the power supply situation would hardly be improved in the time available even if the Duke Power Company departed from generally accepted utility practice of relying principally on construction of its own generating capacity to provide for its own loads and sought to buy power from others instead of completing the construction of the Oconee Nuclear Units.

Even if time were available for new construction, these neighboring systems and operating pools would be hard put under the present conditions of popular environmental concern, to find the sites for plants whose principal purposes would be to export power to distant utility systems. These systems in common with utility systems everywhere are having difficulties in timely construction of new capacity to improve their own unsatisfactory reserve margins. Even though it is highly desirable to have a strong transmission network interconnecting regions for purposes of improved diversity and reserve backup, such interconnections together with out-of-the-area generation would not lessen the overall impact of power facilities on the environment.

It is evident, therefore, that if the Duke Power Company and the Virginia-Carolinas Reliability Group are to meet expected loads in 1973, reliance cannot be placed on the import of required firm power from neighboring systems and pools to the north, south or west as a substitute for the proposed Oconee Nuclear Power Plant.

Hydro Power Alternate

A hydroelectric installation as a substitute for a nuclear Oconee Power Plant must be ruled out as a practical consideration because of the lack of a site with a potential high enough to satisfy the requirements of the Company and the Virginia-Carolinas Reliability Group. Moreover, the lack of time between the present and the appearance of the 1973 loads for construction for such an installation and the stream flows in the region which limit any hydroelectric installation, conventional or pumped storage, to service as a peaking facility, are factors which mitigate against such a substitution.

There is some hydroelectric planning in the service area of the Virginia-Carolinas Reliability Group, but little prospect that this will materialize in time as substantial generating capacity to be useful by 1973. For example, the Virginia Electric and Power Company's Marble Valley pumped storage project in the James River Basin with an initial capacity of 1,250 megawatts is scheduled for 1976 but is currently being opposed by municipal and civic groups who fear its impact on the environment. The U. S. Corps of Engineers is building the Gathright Project on the Jackson River in Virginia without generating facilities even though 49 megawatts of power were authorized for the project.

Water Quality

By virtue of its responsibilities under the Federal Power Act for licensing of non-Federal hydroelectric projects, the Federal Power Commission has a direct interest in the water quality of streams and reservoirs associated with the hydroelectric projects which come under its jurisdiction. Water quality of the Keowee Reservoir as it might be affected by the siting of steam generating plants on its shores came under investigation at the time of the granting of a license for the Keowee-Toxaway hydroelectric installation, Project No. 2503.

In its order issuing a license for this project, the Commission found that the use of Keowee Reservoir as a source of condenser cooling waters for up to 3,000 megawatts of nuclear steam-electric power would produce no detrimental effects upon the fishery resources within the reservoir. The order also authorized the Licensee to use the reservoir at a site designated as "Site L" for this purpose. Since the capacity of three units of the Oconee Nuclear Station is less than 3,000 megawatts

and since the plant is to be constructed as "Site L", the operation of the three nuclear units of the Oconee Power Plant should have no detrimental effect on water quality.

With regard to the Keowee Reservoir, however, the Licensee is not permitted to initiate construction of any other steam-electric plants without prior approval of the Commission (Article 23 of the License). The Licensee is also required to establish and to carry out adequate monitoring of the thermal effects of any "Site L" plant operations and to collect climatological data necessary for the Commission to establish the thermal effects of any other steam-electric plants which the Licensee may propose for construction in the future. (Article 29 of the License).

In the interest of pollution abatement and other beneficial public uses, the Commission required the Licensee to cooperate with the South Carolina Water Pollution Control Authority, and to release a minimum daily average flow of up to 152 cubic feet per second or such lesser amount specified by the Authority, and provided guidelines for checking the amount of water so discharged.

Continuing Environmental Responsibilities

In addition to the responsibilities of the Commission in administering the license for the Keowee-Toxaway Project as outlined under water quality, the Commission has other continuing responsibilities with respect to the impact of the project on the environment, as specified by special license articles requiring:

(a) Licensee financing of archeological surveys at project reservoir sites (Article 39)

(b) Licensee submittal for Commission approval of supplemental information to ensure that the recreation facilities and lands are adequate for present and future public needs (Articles 41 and 42)

(c) The Commission be kept informed by the Licensee during planning for the relocation of all roads in the areas to be inundated by project reservoirs, of plans for boat passageways to insure full recreational utilization of project waters (Article 43)

(d) Commission approval of a plan for clearing the reservoir areas which shall be prepared following consultation with appropriate Federal and State conservation, health, and recreation agencies (Article 45)

In addition to these provisions, the license is subject to conditions in Form L-11 (9/1/66) "Terms and Conditions of License for Unconstructed Major Project Affecting the Interests of Interstate or Foreign Commerce" which contains the following articles by which the Commission can exercise continuing regulation over other aspects of the project's impact on the environment:

(a) Article 13 provides for Commission control over the use, storage and discharge from storage of waters affected by the license for the protection of life, health, and property, and conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreation purposes.

(b) Articles 16 and 17 -- relate to licensee responsibilities to conserve and develop fish and widelife resources and to permit the United States to do so if it so desires.

(c) Articles 18 and 19 -- relate to licensee responsibilities to provide and maintain recreation facilities, or to permit others to do so, and to allow free public access to project waters and adjacent project lands.

(d) Article 20 -- concerns licensee responsibility for prevention of soil erosion, stream siltation or pollution which might occur as a result of construction, operation, or maintance of the project.

(e) Article 22 -- relates to good housekeeping with respect to clearing if lands and disposal of material at the project including temporary structures, unused timber, brush, refuse or inflammable material.

(f) Article 24 -- has to do with restoration of project area and stream upon abandonment of the project by removal of all structures, equipment and power lines.

APPENDIX D

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

HEALTH AND ENVIRONMENT

25 AUG 1970

Mr. Harold L. Price
Director of Regulation
Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Price:

We have reviewed the environmental statement prepared by the Duke Power Company as requested by your letter of July 22, 1970. In addition, we have reviewed the Preliminary Safety Analysis Report for the Oconee Station for the purpose of evaluating potential accident impact on the environment.

The following comment on the environmental statement is provided:

> Insufficient information is presented within the statement to permit evaluation of environmental impact. Estimated radioactive releases and exposures during normal operations and accident conditions should be presented and related to the AEC limits of 10 CFR 20 and 10 CFR 100. It is noted, however, that this information is derivable from the Preliminary Safety Analysis Report.

Based upon the content of the Preliminary Safety Analysis Report, it is concluded that if conditions are met for approval by the AEC of pending application for the necessary permits and licenses to construct and operate the proposed Oconee Station, there is reasonable assurance that the environment will not be adversely affected.

Sincerely,

M. G. Patton, M.D.
Acting Deputy Assistant
Secretary (Environmental Quality)

APPENDIX E

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

WASHINGTON, D. C. 20410

Mr. Harold L. Price
Director of Regulations
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Price:

This is in reply to your letter of July 23, 1970, which requested comments on the environmental report of the Duke Power Company for its proposed power station which is to be known as the Oconee Nuclear Station and is part of the Keowee-Toxaway Project, which is currently under construction.

The Federal Power Commission issued a license in September 1966 which authorized Duke Power Company to proceed with the Keowee-Toxaway Project. This project is located at the meeting of the Piedmont Hills and the Southern Blue Ridge Mountains in Oconee and Pickens County, South Carolina and Transylvania County, North Carolina, and along the Keowee River and its tributaries. Construction of the Keowee Hydro Station, the Jocassee Hydro Station with pumped storage, and the Oconee Nuclear Station will result in an initial power capacity of 3,408,000 kilowatts. The long-range expectation of the project is to achieve electric generating capacity of 10 million kilowatts. The Oconee Station itself would consist of three units of 886,300 kw each, utilizing pressurized water type reactors.

HUD Comment

We believe, with the reservations noted below, that Duke Power's statement indicates reasonable treatment of environmental consequences. We defer to other agencies on standards for air and water quality, safety, and radiation and thermal pollution standards.

HUD Reservation

1. The statement from Duke Power Company indicates the importance of this project to the economic development of this region or Appalachia.

The Company states that these plans are being coordinated with the planning agencies of the two counties involved. However, the impact of this project will extend well beyond these local counties and we therefore suggest that the final environmental impact statement should be submitted to the agency designated in Budget Bureau Circular A-95 as the regional planning clearinghouse. In this case, the designated agency is:

South Carolina Appalachian Regional
Planning and Development Commission
Dalton Building
18 Thompson Street
Greenville, South Carolina 29601

* * * * *

We would appreciate having a copy of the final environmental statement sent to our Regional Administrator, Mr. Edward Baxter, Peachtree-Seventh Building, Atlanta, Georgia 30323.

Sincerely yours,

Charles J. Orlebeke
Deputy Under Secretary

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
WASHINGTON, D.C. 20201

AUG 28 1970

Mr. Harold L. Price
Director of Regulation
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Price:

Thank you for your letter of July 22, 1970, to Mr. Roger Strelow transmitting the "Environmental Statement" for the Oconee Nuclear Station. We have considered this statement in our review of the facility which is required by the provisions of the National Environmental Policy Act of 1969. In response to your request for comments, we are pleased to provide the enclosed report by our Bureau of Radiological Health which states our position on the proposed operation of the plant based on an evaluation of the public health and environmental aspects of the facility.

The Bureau's review is based primarily on information contained in the Final Safety Analysis Report. It is recognized that other design information may become available before an operating permit is granted, but we believe our environmental evaluation is substantially completed at this time, unless, of course, major changes occur.

When the other agency comments are compiled, we would be most happy to receive them. If this Department can assist you further in this matter, we would be happy to do so.

Sincerely yours,

Roger O. Egeberg, M.D.
Assistant Secretary
for Health and Scientific Affairs

Enclosure

PUBLIC HEALTH REVIEW

OCONEE NUCLEAR STATION UNITS 1, 2, and 3

August 1970

Project Officers: Ted W. Fowler — Ted W. Fowler

Approved: Charles L. Weaver — Charles L. Weaver
Director, Division of
Environmental Radiation

James E. Dieckhoner — James E. Dieckhoner

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service
Bureau of Radiological Health
Division of Environmental Radiation
Nuclear Facilities Branch

INTRODUCTION AND CONCLUSIONS

The purpose of this report is to summarize the results of an evaluation by the Public Health Service of the environmental effects of the Oconee Nuclear Station (Units 1, 2, and 3) under construction on Lake Keowee near Seneca, South Carolina. The evaluation is based on information provided by the Duke Power Company in its Final Safety Analysis Report (FSAR)[1] and the Company's "Environmental Statement"[2] relative to the National Environmental Policy Act. The technical review of these documents was conducted by the staff of the Nuclear Facilities Branch of the Service's Bureau of Radiological Health. This review is an updating of an evaluation of the facility that was made by the Branch prior to construction.[4] This earlier evaluation was based on information contained in the Preliminary Safety Analysis Report[5] and the results of a site survey made in May 1967.

The review and evaluation covered by this report are directly responsive to requirements placed on Federal agencies by the National Environmental Policy Act and as such are intended to state the position of the Department of Health, Education, and Welfare on the environmental effects of this facility. The report is also intended, in the traditional role of the Public Health Service, to provide information to the South Carolina State Board of Health for use in conducting their radiological health program for the facility. A number of technical documents[3,6] have been developed by the Branch to expand the details of and support the discussions presented.

This review included consideration of radioactive waste handling, environmental surveillance, emergency planning, and potential radiation doses to the public. The major conclusions of this review are as follows:

1. All three units of the facility are typical of pressurized water reactors of current design[3] and contain the best waste systems available when the design was finalized. Radioactivity discharges are expected to be low and of minimal health risk as indicated by our recent studies. The environmental statement should, however, contain a commitment by the Company to use all waste systems in such a way that discharges will be kept as low as practicable.

2. We are satisfied that the applicant will work with the South Carolina State Board of Health in its responsibility to conduct surveillance of the operation of the facility and that adequate monitoring will be performed.

3. Although the Company has developed an emergency plan and included the health department in its notification list, we would like to see a clearer recognition by the Company that the State is the only agency that can initiate protective actions in the offsite area and of the Company's commitment to assist the State in this regard by immediate notification of all incidents, by providing source monitoring data, and by monitoring of offsite areas.

4. The gaseous discharge limit for the facility should consider the multiple units and should be applied in such a way to avoid additive effects that would exceed recommended guides at the nearest point of residence, which is within the site boundary. If some valid justification exists for not considering the location of this residence then it should be presented for critical review and analysis.

5. Within the context of the above we are of the opinion that the Oconee Nuclear Station can be operated without significant effect on the environment or the public.

RADIOACTIVE WASTE DISCHARGES

Since this nuclear power station will eventually have three units operating at this site, the radioactive waste discharge limits must account for this factor. The liquid waste treatment system design proposed is similar to other pressurized water reactor systems and should be capable of reducing the level of radioactivity in the effluent sufficiently so that exposures to the population through the water pathway will be well within Federal Radiation Council guidance.

As stated in section 11.2.3.1 of the FSAR,(1) the gaseous waste disposal system for Unit 3 is normally separated from the system used jointly for Units 1 and 2. The applicant must exercise caution to see that the combined releases from both systems do not exceed the Station's

discharge limit. The administrative controls, alluded to in section 11.1.1.4,[1] may need to be augmented by an automatic system. This system would sum the gaseous discharges from all disposal systems and provide suitable alarms or automatically activated devices which would correct the situation.

The gaseous discharge limit for Oconee Nuclear Station is based on the dose delivered to a person situated at the station's boundary. This criterion assumes that there are no permanent residents within this boundary. Throughout the FSAR,[1] reference is made to an exclusion area radius of one mile. This figure is used in section 2.3.2[1] in calculating the atmospheric dilution factor to which gaseous radioactive effluents will be subjected before members of the general public may be exposed. It is also stated,[1] however, that there will be a leased residence within this radius, at a distance of 4,470 feet from the reactor building. The occupants of this residence must be considered as receiving their exposure on a continuous basis. The applicant should consider the distance to this residence when calculating his atmospheric dilution factor. If some valid justification exists for not considering the location of this residence, then this justification must be presented for critical review and analysis.

The applicants environmental statement lacks a definitive statement of company policy with respect to the intent of the recent proposed amendments to Parts 20 and 50 of the Atomic Energy Commission regulations

regarding the reduction of radioactive discharges to the lowest practicable level. It would be desirable for such a statement to be included that would clearly indicate the applicant's intentions with respect to the management of gaseous and liquid radioactive waste discharges to the environment.

ENVIRONMENTAL SURVEILLANCE

The applicant indicates in the environmental statement(2) that levels of radioactivity discharged from Oconee Nuclear Station "will be confirmed by a continual environmental radioactivity monitoring program conducted by Duke Power Company with backup environmental monitoring by the South Carolina Board of Health and the U.S. Atomic Energy Commission." It may be of mutual benefit to both Duke Power Company and the South Carolina Board of Health to develop a cooperative environmental surveillance program. This is so even if the only objectives are to eliminate a duplication of effort and to exchange data. In any case; however, it is important that the South Carolina Board of Health's program include the proposed backup monitoring which will provide a cross-check of any surveillance data supplied by the applicant.

In general, the pre-operational surveillance program submitted by the applicant is adequate; however, it is suggested that (1) the program include monitoring of liquid effluents in the tailrace of the Keowee Hydroelectric Plant, where liquid wastes from the Oconee Nuclear Station are discharged, and in Lake Keowee for specific radionuclides

which will be discharged and which could be significant in terms of reconcentration in freshwater fish, (2) the edible portion of food crops and vegetation need be sampled at the time of harvest instead of the proposed quarterly frequency, and (3) radiation dose assessment be done at the residence within the exclusion area with a TLD monitoring system.

In addition to a specific analysis of fish and water for ^{90}Sr and ^{137}Cs as proposed by the applicant, the surveillance program should include monitoring of liquid effluents in the tailrace of the Keowee Hydroelectric Plant and in Lake Keowee for ^{134}Cs, ^{58}Co, ^{60}Co, ^{89}Sr, and ^{131}I which are the expected critical radionuclides based on measurements made at Yankee Nuclear Power Station[6] during a Division of Environmental Radiation (DER) field study. The majority of the ^{134}Cs is reconcentrated in edible fish tissue and some of the ^{58}Co, ^{60}Co, and ^{131}I may also be deposited in the edible portion of fish. In general, ^{89}Sr, ^{58}Co, and ^{60}Co are not significant from a population exposure standpoint because they concentrate in non-edible portions of fish, i.e., strontium in the bone and cobalt in the liver and kidney. Iodine-131 is a significant critical radionuclide mainly because of its relatively high radiotoxicity. Although the ^{131}I is mainly concentrated in the fish thyroid, some of the ^{131}I may be deposited in the edible portion of the fish. Should detectable concentrations of these specific radionuclides be found during the operation of the plant, the ^{89}Sr to ^{90}Sr, and ^{134}Cs to ^{137}Cs ratios will provide an indication as to the relative contributions of fallout and Oconee discharges.

The applicant stated in the PSAR[5] that the operational surveillance program "will be modified as indicated by experience, particularly by the kinds and quantities of radioactive liquid and gaseous wastes released, as well as by environmental monitoring results." Thus, it appears that the applicant plans to periodically evaluate plant discharges and to modify the surveillance program as indicated by changes in the radionuclide composition of the wastes. The applicant also plans to make the results of the Oconee Environmental Radioactivity Monitoring Program available to the State of South Carolina and interested Federal agencies. If the applicant reports its surveillance results in terms of specific radionuclides and if the surveillance program is continually modified as indicated by experience, both the State of South Carolina and the appropriate Federal agencies can use the surveillance data provided by the applicant to determine population doses in the environs of Oconee Nuclear Station from all sources including the facility.

The results of an environmental surveillance program that includes the suggested specific radionuclide analysis will provide useful data for subsequent evaluation of the critical population exposure pathways from operation of the proposed Oconee plant.

RADIOLOGICAL ASSISTANCE PLANNING

The importance of emergency planning was emphasized in the public health evaluation of Oconee Nuclear Station dated December 1966[4] and since the writing of this report, an emergency plan has been established

at Oconee. The applicant stated in the FSAR[1] that they gave copies of their emergency plan to the South Carolina State Board of Health, the AEC Emergency Radiological Monitoring Team, and other participating outside emergency units who discussed the plan with the utility. In our judgment, the applicant should make maximum use of emergency planning capability in order to provide full protection to the public in all accident and emergency situations. In this regard, he should formally recognize that only the State has the authority to initiate action measures to protect the public health and that he will immediately notify the State of all incidents, that he will provide source monitoring data, and will otherwise assist the State in designing and carrying out procedures to assess the ensuing environmental levels and their public health effects.

REFERENCES

1. "Oconee Nuclear Station, Units 1, 2, and 3, Final Safety Analysis Report," The Duke Power Company, June 1969.

2. "Environmental Quality Features of Duke Power Company's Keowee-Toxaway Project," The Duke Power Company, July 1970.

3. "A Pressurized Water Reactor Nuclear Power Station," U.S. Department of Health, Education, and Welfare, Public Health Service, Bureau of Radiological Health, Division of Environmental Radiation, Nuclear Facilities Branch, September 1, 1967.

4. Martin, J.E., NF-67-7, "Public Health Evaluation, Oconee Nuclear Station," U.S. Department of Health, Education, and Welfare, Public Health Service, Bureau of Radiological Health, Division of Environmental Radiation, Nuclear Facilities Branch, August 1967.

5. "Oconee Nuclear Station, Units 1, 2, and 3, Preliminary Safety Analysis Report," The Duke Power Company, December 1966.

6. BRH/DER 70, "Radiological Surveillance Studies at a Pressurized Water Nuclear Power Reactor," Kahn, B., R. Blanchard, et al., in course of review and publication.

APPENDIX G

(65)

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

SEP 3 1970

SEP 3 1970

Mr. Harold L. Price
Director of Regulation
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Price:

This is in response to your letter of July 22, 1970, requesting USDA comments on the environmental statement for Oconee Nuclear Station, Units 1, 2, and 3, of Duke Power Company.

The statement has been reviewed in the relevant agencies of the Department and we have no comments to make.

Sincerely,

T C Byerly

T. C. BYERLY
Coordinator of
Environmental Quality Activities

2834

STATE OF SOUTH CAROLINA

Office of The Governor

Columbia 29211

ROBERT E. McNAIR
GOVERNOR

50-269
50-270
50-287
~~50-338~~

cy.

September 17, 1970

Mr. Harold L. Price
Director of Regulation
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Price:

Reference is made to the pending application before the Atomic Energy Commission by Duke Power Company for an operating permit for its Oconee Nuclear Station. Enclosed are comments from State agencies with the authority for establishing and enforcing environmental standards as well as comments from agencies with an interest in this matter.

It is the opinion of the State of South Carolina as represented by these State agencies that the granting of an operating permit to Duke Power Company for its Oconee Nuclear Station by the Atomic Energy Commission will have less adverse environmental effects than its alternatives and urges the granting of that Permit.

Sincerely,

Robert E. McNair

REM:AMB
Enclosures

(67)

SOUTH CAROLINA

STATE HIGHWAY DEPARTMENT

DRAWER 191

COLUMBIA, S. C. 29202

September 14, 1970

Mr. Clair P. Guess, Jr.
Executive Director
S. C. Water Resources Commission
2414 Bull Street
Columbia, South Carolina 29201

Dear Mr. Guess:

This letter is to formally advise you that the South Carolina State Highway Department does not wish to enter an objection to the licensing of the proposed nuclear fuel reprocessing plant to be constructed near Barnwell by Allied Gulf Nuclear Services or to the operation of the Oconee Nuclear Station by Duke Power Company.

Our Mr. M. D. Moseley, Deputy State Highway Engineer, attended the meeting in your office on September 2, 1970, at which time information concerning the environmental effect of these two plants was made available and explained by representatives of Allied Gulf and Duke Power Company. From the information presented at this meeting, we do not feel that these plants will have an adverse environmental effect upon the highways or persons using the highways of this state.

The problems involved in the transportation of this spent nuclear fuel to the Barnwell reprocessing plant are being discussed by the Department directly with the agencies which would transport this fuel, and we expect to be able to arrive at a mutually agreeable solution to the transportation of these heavy loads so as not to damage the roads or bridges on the State Highway System.

We trust this is the information that you desire for making your report.

Sincerely yours,

S. N. Pearman
Chief Highway Commissioner

STATE OF SOUTH CAROLINA
OFFICE OF THE ATTORNEY GENERAL
POST OFFICE BOX 11549
COLUMBIA, S. C. 29211

September 14, 1970

Mr. Clair P. Guess, Executive Director
Water Resources Commission
2414 Bull Street
Columbia, South Carolina 29201

Dear Mr. Guess:

Pursuant to the procedures embodied in the Environment Policy Act, the South Carolina Attorney General's Office, acting as legal counsel for the Pollution Control Authority, has no comments to make in regard to the Duke Power Company. This office was well pleased with the effective steps the Duke Power Company has taken in its ecological preservation plans for nuclear power station in Oconee County. This project should be for many years to come beneficial to the citizens of the entire State of South Carolina

Very truly yours,

James H. Quackenbush

James H. Quackenbush, Jr.
Assistant Attorney General

JHQ/s1

PRT

Bob Hickman
Executive Director

September 14, 1970

Mr. Clair P. Guess, Jr., Executive Director
Water Resources Commission
2414 Bull Street
Columbia, South Carolina 29201

Dear Clair:

The following observations and comments are offered on behalf of our Department after hearing the presentations of Allied Gulf and Duke Power Company concerning environmental implications of their respective projects.

With reference to Allied Gulf's planned nuclear fuel reprocessing facility at Barnwell, we can see nothing in this development that would be adverse to any existing or proposed recreation developments in that general area.

With reference to Duke Power's Keowee-Toxaway project, it is our feeling that the Company has incorporated sufficient features in its plan to enhance the environment of the area for recreation purposes. We are pleased that the Company has set aside a number of tracts of land around the empoundments for public and private recreation developments. The Company already has deeded a 1,000 acre tract of land on Lake Keowee with substantial frontage on Lake Keowee to the State of South Carolina for a new state park. It appears that Duke Power Company has given substantial consideration also to opportunities for public enjoyment of the scenic beauty of the area.

We appreciate the opportunity to be a part of the reviewing team for these projects.

Sincerely,

Bob Hickman
Director

BH:dem
cc: Mr. Bill Marsh
Mr. Ray Sisk

758-2566

South Carolina Department of Parks, Recreation & Tourism — Box 1358, Columbia, South Carolina 29202

SEP 8 1970

(70)

South Carolina State Board of Health

J. MARION SIMS BUILDING
COLUMBIA 29201

E. KENNETH AYCOCK, M.D.
SECRETARY AND STATE HEALTH OFFICER

September 3, 1970

Mr. Clair P. Guess, Jr., Executive Director
South Carolina Water Resources Commission
2414 Bull Street
Columbia, South Carolina 29201

Dear Mr. Guess:

This is in regard to Duke Power Company's Environmental Report for the Oconee Nuclear Station. The State Board of Health, as the Agency engaged in the regulatory control of ionizing radiation, has reviewed the report.

Based on this review the State Board of Health has no questions to propose with regards to Duke Power Company's Environmental Report.

Very truly yours,

Heyward G. Shealy

Heyward G. Shealy, Director
Division of ~~Radiological~~ Health

HGS:njc

(71)

SEP 10 1970

South Carolina
WILDLIFE RESOURCES DEPARTMENT

POST OFFICE BOX 167 COLUMBIA, SOUTH CAROLINA 29202

September 8, 1970

Mr. Clair P. Guess, Jr., Executive Director
S. C. Water Resources Commission
2414 Bull Street
Columbia, South Carolina

Dear Mr. Guess:

Reference is made to the hearing held last week concerning Environmental Quality. The representatives from Duke Power Company answered all of our questions either orally or within their reports.

We have no objection to the granting of an operating permit to Duke Power Company for their Nuclear facility now under construction.

Yours truly,

Jefferson C. Fuller, Jr.
Chief, Game and Fish Management

JCFjr/mo

cc: Director Pat Ryan

(72)

SEP 3 1970

South Carolina
State Commission of Forestry

JOHN R. TILLER
STATE FORESTER

P. O. BOX 287
COLUMBIA, S. C. 29202

September 4, 1970

Mr. Clair P. Guess
Executive Director
South Carolina Water Resources Commission
2414 Bull Street
Columbia, South Carolina 29201

Dear Mr. Guess:

As you know E. C. Pickens represented the Forestry Commission at the Environmental Policy Meeting in your office on September 2. At this meeting both Duke Power Company and Allied-Gulf Nuclear Services presented their Environmental Report. Our comments and recommendations would only apply to the possible impact of these plant operations on forest lands.

We see no objections to Duke Power Company's proposals. It has been our observations during the past thirty years that the Duke Power Company has attempted to manage their woodlands for multiple-use purposes including high value forest products. It appears that they have incorporated this multiple-use concept in their environmental quality program.

I do have some question concerning the Allied-Gulf request:

1. Allied-Gulf stated that their cooling water would be returned to their holding pond at 101°F. They estimated water leaving this holding pond would be 93°F. Perhaps consideration should be given to a larger holding pond allowing more convection and evaporative cooling prior to release.

2. Would it be possible to get a little more detailed information on the water level to be maintained in Lower Three Runs Creek at this rate of discharge since any water level change would have an effect on the ecology of this area?

Very truly yours,

John R. Tiller
State Forester

JRT:yr

South Carolina Pollution Control Authority

J. MARION SIMS BUILDING
Columbia, South Carolina 29201

AREA CODE 803
TELEPHONE: 758-5416

Septembe. 9, 1970

Mr. Clair P. Guess, Jr., Executive Director
S. C. Water Resources Commission
2414 Bull Street
Columbia, South Carolina 29201

Dear Mr. Guess:

The following comments on Duke Power Company are noted as the result of our Environmental Policy meeting on September 2, 1970:

1. Page 3 of the report states no adverse effects on the ecology have been detected due to temperature rises.

   (a) What do they mean by adverse effects?

   (b) What happened to the number of species of micro-organisms due to the increase in temperature? Did they increase or decrease?

   (c) What happened to the number within the species of micro-organisms?

By direction of H. J. Webb, Ph.D., Executive Director, Pollution Control Authority.

Yours truly,

Henry E. Gibson

Henry E. Gibson
Chemist

HEG/dkw

cc: Mr. G. A. Rhame

(74)

STATE OF SOUTH CAROLINA WATER RESOURCES COMMISSION

CLAIR P. GUESS, JR., EXECUTIVE DIRECTOR

3830 BULL STREET, COLUMBIA, S. C. 29201

TELEPHONE (803) 758-2514

September 14, 1970

The Honorable Robert E. McNair
Governor of South Carolina
State House
Columbia, South Carolina 29201

Dear Governor McNair:

The South Carolina Water Resources Commiss n, as the agency charged with establishing a comprehensive water resources policy for the State and coordinating policies and activities among the State departments and agencies, has reviewed the Duke Power Company's Environmental Report for the Oconee Nuclear Station.

Based on a review of the information available, it is the opinion of the South Carolina Water Resources Commission that operating the Oconee Nuclear Station will have less adverse environmental effects than its alternatives, and urges the granting of an operating permit by the Atomic Energy Commission.

Sincerely,

Clair P. Guess, Jr.
Executive Director

CPGJr:fw

STATE DEVELOPMENT BOARD

September 9, 1970

Mr. Clair P. Guess, Jr.
Executive Director
South Carolina Water Resources Commission
2414 Bull Street
Columbia, South Carolina 29201

Dear Mr. Guess:

In response to the request made at the hearing at your office on September 2, the South Carolina State Development Board hereby states its position regarding the application of Duke Power Company to operate its Keowee-Toxaway project now under construction.

The South Carolina State Development Board is in favor of granting the application of Duke Power Company to operate the power generating stations contained in the Keowee-Toxaway project for the following reasons:

a) The increase in electrical power suppiy which is vital to the continuing industrial growth of South Carolina.

b) The increase in employment both during the construction of the project and after the plants have been put in operation.

c) The value of the recreation facilities which are included in the project.

This approval is predicated on the assumption that Duke Power Company will operate the Keowee-Toxaway project without significant damage to the environment as indicated by their past performance.

Very truly yours,

J. Bonner Manly
Director

JBM:ns

DUKE POWER COMPANY

POWER BUILDING, BOX 2178, CHARLOTTE, N. C. 28201

WILLIAM S. LEE
VICE PRESIDENT, ENGINEERING

September 25, 1970

Dr Peter Morris, Director
Division of Reactor Licensing
Atomic Energy Commission
Washington 20545

Re: Oconee Nuclear Station
Units 1, 2 & 3
Dockets Nos 50-269-270-287

Dear Dr Morris:

By letter of September 17 to Mr Harold Price, Governor Robert E McNair transmitted comments of the state agencies of South Carolina with regard to the environmental effects of our Oconee Nuclear Station. Governor McNair's letter urged the granting of our Operating License.

Attached to Governor McNair's letter is a copy of the September 9 letter of the South Carolina Pollution Control Authority which included three questions in connection with page 3 of our report "Environmental Quality Features of Duke Power Company's Keowee-Toxaway Project." These questions are as follows:

"Page 3 of the report states no adverse effects on the ecology have been detected due to temperature rises.

(a) What do they mean by adverse effects?

(b) What happened to the number of species of micro-organisms due to the increase in temperature? Did they increase or decrease?

(c) What happened to the number within the species of micro-organisms?"

We are pleased to submit the following information in response to these questions:

(a) Page 3 of our report stated that the temperature rise through the Oconee condensers was consistent with temperature rises employed on Duke's lakes since 1926, "and no adverse effects on the ecology have been detected." This statement was based on long-term empirical observations that there has been no evidence, or even a single report, of any fish kills on our lakes due to thermal discharges.

(b) & (c)

As a part of the Edison Electric Institute's Research Project #49, biological studies are continuing on Lake Norman in the vicinity of our Marshall Steam Station which has been in service since 1965 with a skimmer wall similar to that provided for Oconee on Lake Keowee. These studies are being managed by scientists at Johns Hopkins University with assistance from local universities, state agencies and company personnel. It can be generally stated that studies of aquatic micro-organisms within the waters of Lake Norman which are thermally influenced by the Marshall Station show that planktonic populations do not reveal significant reductions in species, composition or diversity compared to control stations outside the thermal influence. As the detailed data from this program are assimulated and studied by the many participating groups, reports will be published that will speak more specifically to the effects on each species of micro-organism. Copies of these reports will be furnished to the South Carolina Pollution Control Authority as soon as available.

We have discussed this information with representatives of the South Carolina Pollution Control Authority, and they advise that this is a satisfactory response to their questions.

Yours very truly,

W S Lee

WSL/s

cc South Carolina Pollution Control Authority
Attn: Mr Henry E Gibson

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

September 28, 1970

Dear Mr. Price:

This is in response to your letter of July 22, transmitting the draft environmental statement prepared by the Duke Power Company for the Oconee Nuclear Station, Units 1, 2, and 3, AEC Docket Nos. 50-269, 50-270, and 50-287. We have reviewed the statement and other material available on the project and offer the following comments for your consideration.

We are aware of Duke Power Company's efforts to maintain the quality of the environment and their close cooperative work with several of the field offices of this Department. The Company's many studies, consultations and past monitoring programs and the establishment of its Departments of Water Resources Research and Public Health and Sanitation indicate their willingness to promote efforts to prevent or eliminate damage to the environment. However, the environmental statement should contain pertinent information regarding impacts, both short term and long range, of the proposed plant on the site environs. Such a statement should reasonably contain information on predictable and possible detrimental effects, investigations planned or taking place to determine unknown effects, and the backgrounds and capabilities of organizations retained to conduct the investigations. Most important, the statement should be sufficiently comprehensive to permit regulatory and other review agencies to evaluate the environmental impact in light of their own areas of competence. We think Duke Power Company's documents provide a very broad brush treatment of environmental impact and summarize only the applicant's appraisal of the project's potential impact. Thus, we cannot provide a meaningful appraisal of project environmental impact until the documents are substantially expanded.

We offer the following comments for use in completing the Environmental Impact Statement:

1. Information should be presented on the proposed and alternative facilities and anticipated environmental concentrations of radionuclides in the Keowee River. The concentrations in the Keowee River, though below those required by 10CFR20, appear to be substantially higher than are normally experienced. Levels should be identified both for the proposed and alternative control facilities. Although indicated radioactive wastes in the tailrace may be only 24 percent of the maximum permissable limit, this could be too high when added to other sources of radiation in the area. The capability and cost of equipment which is and which could be provided to limit annual average and short-term radioactivity in the upper reaches of Hartwell Reservoir and especially at the Clemson water intake should be identified as a basis for affirming whether appropriate control has been provided.

2. Information should be presented on the efforts the applicant is making to study thermal effects and prevent negative impact not only in the Reservoir but downstream. Previous studies by Dr. C. J. Velz and a subsequent letter of April 7, 1966, from the then Secretary of Interior Udall to the Federal Power Commission concluded that thermal effects of the proposed Oconee Nuclear Station would "provide no detrimental effects upon the fishery resources." The establishment of the Water Quality Act of 19[illegible] and the publication of the National Technical Committee Report on Water Quality Criteria made it necessary to review these previous comments. Nor is it clear in the present material whether Dr. Velz's 1966 report concerned itself with the entire nuclear megawatt capacity presently planned for the project. Therefore, the environmental statement should contain information that thermal effluents will have no adverse effects on fish, wildlife or other aquatic organisms. The statement should include the possible interactions of several nuclear stations and additional units on the reservoirs under the proposed and alternative waste heat disposal system.

3. Information should be presented on proposed and alternative facilities to prevent the mechanical and/or thermal destruction or damage of fish and other aquatic organisms drawn to or passing through the cooling water intakes.

4. Include a section on proposed and alternative chemical treatment for condenser cleaning and other uses of chemicals which may be used. The section should include a statement on the anticipated effects of the chemicals on the biota and provide assurances that they will not be toxic to the aquatic environment.

5. Present information on the pre- and post-operational water quality monitoring programs now under way or planned for the plant and an evaluation of their effectiveness in appraising the impact of the plant on the environment, particularly as it relates to subsequent recreational and water supply use.

6. Present information on anticipated requirements for waste control facilities as additional units are placed on line.

7. Present information on the visual impact of the Oconee Nuclear Station and other construction and plans to minimize this impact.

In summary, we think the environmental statement is incomplete and should be revised to include the material indicated above. The environmental statement should be a self-contained document.

We appreciate the opportunity of commenting upon this statement.

Sincerely yours,

Assistant to the Secretary
for Policy Planning and Research

Mr. Harold L. Price
Director of Regulation
Atomic Energy Commission
Washington, D. C. 20545

South Carolina Pollution Control Authority

J. MARION SIMS BUILDING
Columbia, South Carolina 29201

AREA CODE 803
TELEPHONE: 758-5416

September 28, 1970

50 270

Dr. Peter Morris, Director
Division of Reactor Licensing
Atomic Energy Commission
Washington D. C. 20545

Re: Oconee Nuclear Station

Dear Dr. Morris:

We have received copies of Duke Power's response to the question raised by our agency. Their response is satisfactory; therefore we have no objection to the granting of an operating permit to Duke Power Company. for their nuclear facility.

Yours truly,

Henry E. Gibson

Henry E. Gibson, Chemist
Pollution Control Authority

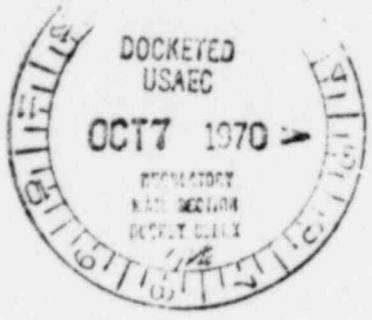
HEG:mo

cc: Mr. W. S. Lee

Regulatory

DUKE POWER COMPANY
POWER BUILDING, BOX 2178, CHARLOTTE, N. C. 28201

WILLIAM S. LEE
VICE PRESIDENT, ENGINEERING



October 5, 1970

Dr Peter Morris, Director
Division of Reactor Licensing
Atomic Energy Commission
Washington, D C 20545

Re: Oconee Nuclear Station
Units 1, 2 & 3
Dockets Nos 50-269-270-287

Dear Dr Morris:

By notice in the Federal Register on July 25, 1970, the Commission indicated that comments on Duke's environmental statement applying to Oconee Nuclear Station had been separately requested from Federal agencies. The Commission's regulations allow 30 days for receipt of those comments, and this letter is to furnish additional information in response to the comments that were received from Federal agencies.

Federal Power Commission - By letter of August 20, 1970 to Dr Seaborg, Chairman Nassikas transmitted the comments of the Federal Power Commission. We agree with those comments, and have been and are continuing to comply with the requirements of our Keowee-Toxaway Project license with respect to the continuing environmental responsibilities of the FPC.

Department of Defense - In their letter of August 25, 1970, the Department of Defense notes that limits of radioactive releases are given in the PSAR, and concludes that there is reasonable assurance that the environment will not be adversely affected. Appropriately conservative limits are also included in Technical Specifications that further assure environmental protection.

Department of Housing and Urban Development - By letter of August 27, 1970, HUD concurred in the environmental consequences of our report and recognized that Duke had coordinated its plans for the project with the planning agencies of two counties. HUD suggested that the environmental report be submitted to the South Carolina Appalachian Regional Planning and Development Commission as the agency having an interest in planning well beyond the local counties.

For brevity, there are many details of our project not discussed in our environmental report. Beginning in 1965, planning of the project was coordinated with the Appalachian Regional Commission in Washington as well as with the South

Carolina Appalachian Advisory Commission in Greenville. We held several meetings with the South Carolina Commission and from time to time furnished them up-to-date information on the project including its expected economic impact in the area. In addition, we submitted a number of the project details to the District Engineer, U S Army Corps of Engineers, Charleston, S C, in connection with his assignment from the Army's Cincinnati office in preparing a comprehensive plan about water resources for submission to the Appalachian Commission at the national level. In summary, our planning of the Keowee-Toxaway Project has been closely coordinated with the appropriate agencies involved in planning work for the Appalachian region.

Department of Health, Education and Welfare - By letter of August 28, 1970, HEW submitted their public health review of the Oconee Nuclear Station. We offer the following information in response to major conclusions in numbe paragraphs 1, 3 and 4 shown on pages 2 and 3 of their report:

1. They suggest that the company commit to use all waste systems in such a way that discharges will be kept as low as practicable. As a matter for inclusion in Technical Specifications, we have committed to use the liquid and gaseous waste handling systems in such a way that quantities of radioactive materials released in combined effluents from the three units will be kept as low as practicable and a very small fraction of the limits of 10CFR20.

3. They suggest that we clearly recognize that the State Health Department is the only agency that can initiate certain actions and that we recognize our commitment to assist this state agency. This relationship and our firm commitment to fully cooperate with the State Health Department is fully recognized in our Emergency Plan developed in cooperation with the State Health Department and other state and local agencies. The details of this Emergency Plan are beyond the intended scope of the environmental statement that we submitted.

4. They suggest that the gaseous discharge limits consider the multiple units, and expressed concern about the leased residence within the site boundary. As indicated in No 1 above, we will operate the waste treatment facilities to limit releases considering the combined effect of all three units. The occupants of the leased residence were the former owners of that home, and the terms of the lease permitted their occupancy except when their removal from the site was in the interest of health and safety as determined by Duke Power. They voluntarily vacated the residence. By Revision 8 to the FSAR (Amendment 16 to Application), at the bottom of page 2-1 dated 7-23-70, we advised that the residence would be removed. Subsequently, the house has been destroyed by fire and will not be replaced.

We appreciate the opportunity to furnish this additional information. We know of no unresolved environmental problems in connection with our Keowee-Toxaway Project of which Oconee Nuclear Station is an integral part. If comments are subsequently received from any other Federal agency, we urge that they not be permitted to delay the proceedings leading to our operating license inasmuch as all parties have had ample time in which to comment beyond the thirty day period prescribed by Commission regulations.

Yours very truly,

W S Lee

WSL/s

DUKE POWER COMPANY
POWER BUILDING, BOX 2178, CHARLOTTE, N. C. 28201

WILLIAM S. LEE
VICE PRESIDENT, ENGINEERING

October 30, 1970

Dr Peter A Morris, Director
Division of Reactor Licensing
Atomic Energy Commission
Washington, D C 20545

Re: Oconee Nuclear Station
Docket Nos 50-269, -270 and -287

Dear Dr Morris:

Please refer to your letter of October 12, 1970 transmitting the Department of Interior's letter of September 28, 1970 commenting on our environmental report for the Oconee Nuclear Station.

In the introductory and closing paragraphs of its letter, the Department of Interior suggests that our environmental statement be substantially expanded to include additional detail. In our cover letter to you of July 10, 1970, transmitting the environmental report, we indicated the report was necessarily brief. At this late stage in consideration of our application for operating licenses on a nearly complete project, it was not feasible to include a broad spectrum of details from our voluminous files of environmental studies that were developed during the early stages of the Keowee-Toxaway Project, of which Oconee is a part. Beginning in early 1965, the many environmental aspects of this project were reviewed step by step with the applicable local, state and federal agencies with the result that every such agency, including the Department of Interior, has concurred in this project including its environmental aspects. We feel that the statement appropriately summarizes the pertinent information from these many proceedings.

With respect to the numbered paragraphs in the Department of Interior's letter, we offer the following:

1. Regarding Interior's comment about radionuclides in the Keowee River, the figure of 24 percent of the maximum permissible limit for radioactive liquid waste was obtained from Table 11-6, p 11-23 of our Final Safety Analysis Report. This table presents the results of calculations of the maximum activity in the station effluent for the three Oconee reactor units, assuming that each was operating with one percent defective fuel for a period of one year! This one percent defective fuel condition is a design assumption that was used in specifying and sizing the radioactive waste disposal systems. The table is not intended to represent the normal or

expected operating condition. Actually, the 24 percent number should be interpreted as a figure of merit! It demonstrates the ability of the radioactive liquid waste system to handle an extreme design condition which is assumed to exist simultaneously in all three reactor units, without exceeding a small percentage of the permissible limits.

The radioactive liquid waste system has provisions for hold-up of liquids in tanks, for decay of radioactivity, for treatment by ion exchange and evaporation to reduce the activity even further and for controlled, monitored release in accordance with AEC regulations (10CFR20). Further, the Technical Specifications for the Oconee Nuclear Station list additional requirements for processing all wastes to reduce the radioactivity to as low a level as practicable within the limits of 10CFR20.

Therefore, because of the over-sized radioactive waste systems that have been provided in the design of the Oconee Nuclear Station and the regulatory requirements for processing these wastes to reduce their activity level and the requirements for controlling and measuring these effluents, the releases from the three units, during normal operation, should total less than <u>one percent</u> of the maximum permissible limits, both on a short-term and on an annual basis.

The Environmental Radioactivity Monitoring Program samples, from the upper reaches of the Hartwell Reservoir and from the Clemson and the Anderson water supply intakes, will confirm that this degree of control has been achieved during station operation.

2. With respect to thermal effects, Interior asks about possible interactions between Oconee and future stations planned for Lake Keowee. Our studies show that the extra temperature in condenser cooling water from each of the future stations will be dissipated without adverse effects among the stations, and the capacity of the future stations will be limited to achieve this result. However, the current regulatory proceeding is with respect to Oconee and not the future stations. Dr Velz's 1966 report and Mr Udall's April 7, 1966 letter were only with respect to a 3000 mwe nuclear station at the Oconee site, which is being developed to 2658 mwe. The terms of our FPC license for Project #2503 will require additional proceedings before that agency and other agencies before the future thermal sites can be developed. Since 1959, Duke has had a full-time group engaged in water resources research with emphasis on thermal effects and with the guidance of a number of consultants. As pointed out in our environmental report, this group will include Oconee in its monitoring program that already covers a number of lakes on our system. These field tests will be used to compare results with predicted behavior and to serve as a sound basis for future developments. The conceptual design of the Keowee-Toxaway Project, including the skimmer wall and condenser cooling water system for Oconee, was based on field analyses of analogous existing developments on our system.

3. Interior suggests that information be presented on proposed and alternative facilities to prevent damage to fish and other organisms drawn to or passing through the cooling water intakes. It should be clearly understood that the "proposed" facilities are already built. The alternative to Keowee-Toxaway was thermal stations with cooling towers but without Lake Keowee as a cooling reservoir. The development of Lake Keowee substantially increases the population of fish and other aquatic organisms which would not have occurred had the alternative been selected. The intakes at Oconee were designed with conservatively low water velocities that have proven successful at our other installations on similar lakes in preventing damage to fish.

4. Interior asks for information on the proposed and alternative chemical treatment for condenser cleaning. The condenser tubes will be cleaned mechanically at Oconee without the use of chemicals.

5. Duke's water resources research group includes the Keowee-Toxaway Project and the upper end of Hartwell in its continuing water quality monitoring program. Sampling stations have been selected and data collection will start shortly as Lake Keowee continues to fill prior to Oconee operation. This, along with continuing post-operation sampling, will serve to appraise the impact of Oconee's operations on the environment. Interior's letter emphasized the impact on recreational and water supply use. As explained in our environmental report, the Keowee-Toxaway Project will provide, and in fact is already providing, substantial recreational and water supply benefits that did not exist before Keowee-Toxaway was built and would not exist if the alternative had been selected.

6. The combined effect of the three units at Oconee was used as a basis of establishing the requirements for waste control facilities. This is further reflected in our comments under Item 1 above.

7. This item suggests that we present information on the visual impact of Oconee and other construction, and our plans to minimize this impact. Through careful project planning as well as architectural treatment, we have attempted to enhance the visual impact of the entire project but not to hide it as "minimize" might suggest. Although located in a remote, lightly-traveled area, the attractiveness of this project is evidenced by the fact that 347,000 visitors have come to view the project since visitors' facilities were completed in July 1969, fifteen months ago. Visitor's comments with respect to the visual impact as noted in the guest book are highly laudatory. The visitors' center itself has just received the 1970 Honor Award of the American Institute of Architects.

We look forward to continued cooperation with the several agencies of the Department of Interior in connection with the environmental aspects of the Keowee-Toxaway Project. Many of these aspects, not found in the alternative to this project, are in the areas of specific interest to the Department of Interior: downstream flow augmentation in

periods of dry weather, extensive recreational opportunities, soil conservation measures, preservation of virgin timber, recovery of historical information and artifacts, substantial fisheries resources, wildlife preservation and propagation, public water supply, flood control, and opportunities for enjoyment of scenic beauty.

We appreciate this opportunity to have furnished this information in connection with the Department of Interior's comments.

Yours very truly,

W S Lee

WSL/s

South Carolina Pollution Control Authority

PHB

HUBERT J. WEBB, PH.D.
EXECUTIVE DIRECTOR
OWEN BUILDING
1321 LADY STREET P. O. BOX 11628
Columbia, South Carolina 29211

AREA CODE 803
TELEPHONE: 758-2915

November 19, 1970

Duke Power Company
P. O. Box 2178
Charlotte, North Carolina 28201

Attention: Mr. W. S. Lee
Vice President, Engineering

Re: Oconee Nuclear Station
Oconee County
Cooling Water

Dear Sir:

After careful study of plans and data submitted by you, we are happy to forward herewith our Permit to Construct the cooling water system for your Oconee Nuclear Station.

Please let us know when the work is completed so that we may make a pre-operational inspection.

By direction of H. J. Webb, Ph.D., Executive Director, Pollution Control Authority.

Very truly yours,

George A. Rhame

George A. Rhame
Assistant Director

GAR/dkw

KENNETH AYCOCK, M.D.
STATE HEALTH OFFICER
CHMN., POLLUTION
CONTROL AUTHORITY

W. T. LINTON, DIRECTOR
DIVISION OF SANITARY ENGINEERING
EXEC. DIR., POLLUTION
CONTROL AUTHORITY

South Carolina State Board of Health

Division of Sanitary Engineering

AND

Pollution Control Authority

COLUMBIA, SOUTH CAROLINA

November 19, 1970

Duke Power Company
P. O. Box 2178
Charlotte, North Carolina 28201

Oconee Nuclear Station

The following project has this day been approved for construction as complying with the Rules and Regulations of the State Board of Health and the South Carolina Pollution Control Authority:

OCONEE COUNTY: Intake and discharge structures for condenser water for the Oconee Nuclear Station.

Water to be taken near the bottom of Lake Keowee from the Little River side and returned to the Toxaway River side.

Maximum water use to be 3,040 mgd.

Temperature requirements of the South Carolina Water Quality Standards to be met at all times.

Approved.

E. Kenneth Aycock, M.D.

George G. Rhame
G. A. Rhame, Asst. Dir.
for H. J. Webb, Exec. Di

S. C. State Board of Health File No. _____

Pollution Control Construction Permit No. 1727

GAR/dkw

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5.7 Environmental Radiation Monitoring

The principal requirements for the applicant's environmental radiation monitoring program are listed in the Technical Specifications. The applicant provided preoperational environmental monitoring data obtained from a program initiated in January 1969. These data provide information on the background radioactivity in the Oconee Nuclear Station area prior to plant startup and we have concluded that they provide acceptable reference data for the continuing environmental radiation monitoring program. The preoperational program included analyses of samples of water, airborne particulates, rain, settled dust, silt (river and lake), vegetation aquatic vegetation, algae and plankton, fish, milk, and animals. No anomalies in environmental radiation levels have been indicated by the preoperational data thus far reported.

The operational environmental monitoring program will be expanded to include two additional onsite air monitoring stations, a continuous water sampling station on the Keowee River, and a thermoluminescent dosimeter network within the exclusion radius.

The Fish and Wildlife Service of the U.S. Department of the Interior has also reviewed the applicant's program and its recommendations have been incorporated into the applicant's environmental radiation monitoring program. The report of the Fish and Wildlife Service is attached as Appendix E. We have concluded that that the applicant's program will be adequate for monitoring the radiological effects of plant operation on the environs and for assessing the effects of releases of radioactivity to the environment from operation of the plant on the health and safety of the public.

9.0 CONTROL OF RADIOACTIVE EFFLUENTS

Liquid and gaseous waste handling facilities are designed to process waste fluids generated by the plant so that discharge of liquid and gaseous effluents to the environment will be minimized. Liquid waste is processed both by direct removal of radioactive material with ion exchange resins and by evaporative separation. Using these methods the volume of radioactive waste will be greatly reduced and the purified liquid streams will either be reused or discharged. Small quantities of radioactive liquid waste will be released routinely to the Keowee Hydro Station tail race where the waste will be diluted and discharged to the Keowee River.

The limits on routine radwaste releases from the three units that are planned for operation at the Oconee Nuclear Station will require that the combined releases from the three units when added together be within the limits specified in 10 CFR Part 20. The specific limits for both liquid and gaseous effluents are included in the Technical Specifications. Under normal operating conditions, however, it is expected that liquid waste releases will contain radioactivity in concentrations that are less than 1% of the 10 CFR Part 20 limits and that the concentrations in gaseous releases will be only a few percent of the 10 CFR Part 20 limits.

Liquid wastes are collected according to expected radioactivity content: wastes containing the highest activity are routed to the waste holdup tanks, intermediate activity wastes are routed to the high activity waste tanks, and low activity wastes are routed to the low activity waste tanks. Low activity wastes can also be present in the condensate test tanks (which, although not defined as a part of the waste disposal system, have been evaluated as such since they are a source of direct release of radioactivity to the plant radioactive waste discharge line).

In addition to holdup, other means are available to reduce the radioactivity in the liquid wastes before release. A waste evaporator and a coolant bleed evaporator are provided. These have the ability to remove radioactivity by evaporation, returning the distillate to the coolant bleed holdup tanks for reuse as reactor coolant makeup, and routing the concentrate, under appropriate conditions, to the solid waste drumming station for packaging as solid waste. Demineralizers also are provided in the coolant treatment system, and these can be used to remove radioactivity from liquid wastes prior to release.

Liquid waste releases are made on a batch basis. As a result of frequent operation of the onsite hydro-station, almost all liquid waste releases are expected to be mixed in a dilution flow substantially greater than the minimum 30 cubic feet per second dilution flow that would be available if the hydro station is not operating. In all cases, the radioactivity content of the waste is measured prior to release and monitored during release.

Oconee Station has been designed and built to minimize the possibility of an accidental release of liquid radioactive waste. The plant design includes the location of all liquid radioactive waste treatment system components below grade in Class I (seismic) structures. Therefore, in order for liquid radioactive wastes to be accidentally discharged, they must be inadvertently pumped to the environment. This pumping capability is controlled from the Unit 1 control room. Further, the radiation monitors on the liquid waste discharge line will terminate the discharge of radioactive liquids if the concentration in the discharge line when mixed with the minimum Keowee Hydro Plant flow (30 cubic feet per second) would exceed 10 CFR Part 20 limits. The Technical Specifications require that liquid wastes be discharged only if (1) concentrations within the limits of 10 CFR Part 20

can be achieved considering no more than the minimum 30 cubic feet per second dilution flow, and (2) the effluent line radiation monitors are operable. The Technical Specifications also require duplicate sampling and analyses of the contents of the low level waste tanks and the condensate test tank prior to initiating any liquid discharge from these tanks. We have, however, evaluated the consequences of a postulated accidental release of liquid waste resulting from a multiplicity of operator errors. We assumed that the contents of the low level waste tanks were inadvertently pumped to the Keowee hydro plant tailrace. This would result in radioactivity concentrations in the tailrace several times 10 CFR Part 20 limits, assuming a minimum dilution flow of 30 cubic feet per second in the tailrace. However, even if a person were to derive 1 day's supply of drinking water directly from the tailrace (the nearest drinking water supply is the Clemson intake 13.7 miles downstream) the resulting dose to the person would be a few percent of the allowable accumulated yearly limit. Because of additional dilution and the approximately 2.5 days required for water from the tailrace to reach the Clemson intake (allowing substantial decay) the resulting dose at that location would be further reduced. In addition, the Clemson water supply, which is owned by the Duke Power Company, is monitored for radioactivity and, if necessary, its use can be terminated for up to 1-1/2 days (storage capacity) to permit a further reduction in radioactivity entering the water supply.

Gaseous radioactive wastes, apart from steam generator or heat exchanger leakage, will be collected principally from the various liquid storage tanks associated with the reactor plant. All gaseous radioactive waste releases will be monitored during discharge. In addition, any release from the waste gas collection system or the reactor building will be analyzed for activity prior to release. The air ejector exhaust on the secondary system

also is regularly monitored for activity to detect radioactivity releases that could occur as a result of steam generator leakage. Similarly, low pressure cooling water systems used to cool components containing reactor coolant are monitored regularly to detect radioactive in-leakage. The consequences of a rupture of a waste gas decay tank are noted in Section 11.0 of this evaluation.

No solid plant wastes will be permanently stored the Oconee site and all solid wastes collected and temporarily kept at the site must be shipped offsite for ultimate disposal at an AEC licensed disposal site.

We have concluded that the radioactive waste system and the procedures for the control of radioactivity releases from Oconee Unit No. 1 are acceptable.

safety significance. The Committee is charged with keeping minutes of all meetings and distributing a copy of these minutes to the Station Superintendent, the Manager of Steam Production and to the Chairman of the General Office Review Committee (discussed above). Findings of this Committee are forwarded to the Station Superintendent for appropriate action.

Preoperational testing of equipment and systems at the site and initial plant operation will be performed by the applicant's personnel with technical support from the B&W Nuclear Power Generating Division's engineers.

We conclude that the applicant's organization is acceptably staffed and technically qualified to perform its operational duties subject to satisfactory completion of licensing examinations of personnel requiring licenses (see 10 CFR Part 55).

12.3 Emergency Planning

The applicant has prepared an Oconee Station emergency plan for dealing with incidents that might involve releases of radioactivity. The plan considers a broad spectrum of accidents that could affect both onsite persornel and the public in unrestricted areas. The emergency plan provides for the shift supervisor to be in direct charge of all emergency operations and to act as emergency coordinator until specifically provided responsible relief by the Station Superintendent. Under this arrangement the shift supervisor will be responsible for protection of other plant personnel, take necessary onsite remedial action to terminate the incident, establish access control to the affected areas, collect preliminary data, obtain necessary outside aid and notify management.

Reliable means of communication are provided within the station by telephone between the control room, various parts of the plant, the Visitors' Center and the Keowee Hydro Plant, and by an onsite public address system. Communications outside the plant include the

telephone, microwave communications with several other of the applicant's facilities; and two-way radio communications among (1) the control room, (2) a Duke Power substation at Central, South Carolina, (3) an emergency vehicle, and (4) a boat.

Continuous wind speed and direction data are telemetered to the station control room. The supervisor also has available in the control room information (e.g., reactor building pressure, temperature and radiation levels) that can be used to evaluate the magnitude of a potential accident. Additional emergency instruments and equipment will be available.

In the event of an emergency that involves areas beyond the jurisdiction of the applicant, arrangements have been made to establish an Emergency Control Center in Walhalla, South Carolina to obtain the assistance of local, State, and Federal agencies. The support groups will, if necessary, establish road blocks, perform radiation monitoring work, and institute other applicable protective measures.

As the various agencies responsible for the public health and safety respond and the Emergency Control Center becomes operable, responsibility for protection of the general public will be transferred from the Shift Supervisor to the Emergency Control Center with the Shift Supervisor remaining responsible for the protection of onsite personnel and station property.

Provisions have been made for medical support including, if required, treatment of radiation-contaminated patients. These include a first aid room within the restricted area of the station and space at the Oconee Memorial Hospital in Seneca, South Carolina. Plant personnel will be trained in first aid procedures and in methods of decontaminating injured personnel. The hospital staff has

been trained in radiological health and contamination control. A physician at Memorial Clinic in Seneca, South Carolina, serving as the company doctor for the Oconee Nuclear Station, has been trained, at an AEC sponsored seminar at Brookhaven National Laboratory, in medical planning and care in radiation accidents.

We conclude that the applicant's emergency plan conforms to the requirements for emergency plans as presented in the proposed change to 10 CFR Part 50.34 of the Commission's regulations and is acceptable.

12.4 Industrial Security

Provisions for industrial security described by the applicant in Amendment No. 11 include perimeter fencing, gate and door access control and a closed-circuit television system coupled with a remote control lock system for off-hour identification and admission of personnel to the facility. Appropriate plans have been developed to control access to Unit 1 of construction personnel working on the units still under construction. We have concluded that the applicant has taken reasonable measures to provide for the security of the facility.

13.0 TECHNICAL SPECIFICATIONS

The Technical Specifications in an operating license define safety limits and limiting safety system settings, limiting conditions for operation, periodic surveillance requirements, certain design features, and administrative controls for the operating plant. These specifications cannot be changed without prior approval of the AEC. The applicant's proposed Technical Specifications have been modified, in Amendment No. 24, as a result of our review, to describe more definitively the allowable conditions for plant operation. The Technical Specifications, as approved by the regulatory staff, will be available for examination in the Commission's Public Document Room.

The new and larger operating pool can be expected to have a higher peak load than the old CARVA pool. The new members are planning additions to installed capacity of 248 megawatts during the three years to 1973, but these additions will have little effect on the reserve margins of the Group which will be similar to those of the old CARVA pool.

In general we feel that reserve margins which fall below the 15-20 percent range are detrimental to reliability of electric supply of any operating pool.

On the basis of anticipated loads and scheduled additions to generating capacity, it is evident that the Oconee Nuclear Units are needed not only by the Duke Power Company's system alone but also by the Virginia-Carolinas Reliability Group.

The Fuels Situation

Against the background of the electric supply situation of the Middle Atlantic and Southeastern States, the fact that the Oconee Power Station is planned as a nuclear plant stands out as particularly noteworthy. This is so because of the shortages which are developing in the domestic supplies of natural gas and coal and because of the continuing world shortage of low-sulfur residual fuel oil. Severe shortages of natural gas are anticipated during the next few years particularly along the eastern seaboard where substitute generating capacity for the Oconee Power Plant would logically be situated. These shortages can be expected to preclude the burning of this valuable natural resource for electric power generation in these areas.

A similar situation has recently developed with respect to coal supply although for different reasons. Many utilities east of the Mississippi are continuing to experience a decline of coal storage piles because of a shortage of coal on the utility coal markets. While this situation will eventually clear up with an improvement in the economics of mining coal, the current coal shortage is likely to extend to 1973 and beyond. If this should prove to be the case, a coal fired substitute for the Oconee Nuclear Power Plant, might not be able to deliver its rated capacity when needed.

[illegible]

Any fossil fuel plant as an alternate to the nuclear Oconee Plant would necessarily add to the particulate or gaseous burden of the South Carolina atmosphere. At the present time all of the steam-generating stations of the Duke Power Company depend on coal as the principal fuel.