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DOCKET NUMBER
PROD. & UTIL. FAC. 50-269,270,287

BEFORE THE

UNITED STATES ATOMIC ENERGY COMMISSION

In the Matter of DUKE POWER COMPANY	)))	DOCKET NOS. 50-269 50-270 50-287

In compliance with directions of the Atomic Safety and Licensing Board at the public hearing in the captioned matter at Walhalla, South Carolina on August 20-30 and September 12, 1967 and in accordance with Section 2.754 of the Commission's "Rules of Practice", 10 CFR Part 2, the Applicant Duke Power Company respectfully submits the attached proposed findings of fact and conclusions of law in the form of a proposed initial decision.

This 22nd day of September, 1967.

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Public Proceedings
Branch

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U.S. ATOMIC ENERGY COMMISSION

By William H. Grigg
William H. Grigg

September 22, 1967

BEFORE THE

UNITED STATES ATOMIC ENERGY COMMISSION

In the Matter of	)	DOCKET NOS. 50-269
	)	50-270
DUKE POWER COMPANY	)	50-287

PROPOSED FINDINGS OF FACT AND
CONCLUSIONS OF LAW SUBMITTED BY
THE APPLICANT DUKE POWER COMPANY
(IN THE FORM OF A PROPOSED INITIAL DECISION)*

1. This proceeding involves the license application filed by Duke Power Company (Applicant) with the Atomic Energy Commission (Commission) under Section 104b of the Atomic Energy Act of 1954 (the Act), as amended. In its application, as supplemented and amended, the Applicant has requested, among other things, authority to construct three closed cycle pressurized water reactors, to be known as Oconee Nuclear Station Units 1, 2 and 3, each to operate initially at 2452 thermal megawatts and to be located on the shore of future Lake Keowee, in Oconee County, South Carolina, about eight miles northeast of the Town of Seneca, South Carolina. (Partial Summary, pp. 1 and 2; Safety Evaluation, pp. 1 and 3).

2. The application was reviewed by the Regulatory Staff (Staff) of the Commission which concluded that the Applicant has satisfied all Commission requirements for the issuance of construction permits. (Safety Evaluation,

* In this document, the transcript is cited as "T.p.___", the Applicant's Partial Summary of Application (T.p. 338 et seq.) as "Partial Summary", the Staff's Safety Evaluation (T.p. 397 et seq.) as "Safety Evaluation", and the Application, as supplemented and amended (T.p. 261 et seq.) as "Application".

pp. 76-77). The application was also reviewed by the Advisory Committee on Reactor Safeguards which concluded that the Oconee Nuclear Station can be constructed at the proposed site with reasonable assurance that it can be operated without undue risk to the health and safety of the public. (Safety Evaluation, Appendix A).

3. On July 24, 1967, the Commission issued a "Notice of Hearing on Application for Provisional Construction Permit" in the captioned matter which set out the issues to be considered and initially decided by this Atomic Safety and Licensing Board, appointed by the Commission to conduct the proceeding, as a basis for determining whether provisional construction permits should be issued to the Applicant (32 F.R. 10996).

4. On August 10, 1967, the State of South Carolina filed a petition to participate in the proceeding pursuant to Section 2.715(c) of the Commission's "Rules of Practice", 10 CFR Part 2. Such participation was allowed by Order of this Atomic Safety and Licensing Board under date of August 11, 1967. The State of South Carolina did participate in the proceeding by the presentation of unsworn statements by several State officials at the public hearing on August 29, 1967. (T.p. 159 et seq.) All of such statements supported the application of Duke Power Company.

5. On July 25, 1967, a group of cities and towns in North Carolina, which term themselves the Piedmont Electric Cities, filed a joint "protest" to the construction of the three nuclear units by Duke Power Company. The protest included a request that conditions be attached to any construction permits to provide for the purchase by the Piedmont Electric Cities of an undivided interest in the proposed nuclear power plants. The requests

contained in the protest were denied and the protest dismissed by Order of this Atomic Safety and Licensing Board on August 9, 1967.

On August 11, 1967, the same group of cities and towns (all of whom are wholesale power customers of Duke Power Company), along with a non-profit corporation, Piedmont Cities Power Supply, Inc., filed a joint petition to intervene in this proceeding, alleging that the Commission is without jurisdiction to grant the Section 104b construction permits and licenses sought by Duke Power Company for the reason that the proposed utilization and production facilities are not experimental in character, and do not constitute any research and development project, but in fact are commercial enterprises that should be licensed, if at all, only pursuant to Section 103 of the Act. These same parties also filed a motion to dismiss the application of Duke Power Company on the grounds that the Commission does not have jurisdiction to issue the licenses requested by Duke Power Company under Section 104b of the Act. The petition to intervene also alleged that Piedmont Cities Power Supply, Inc. has been organized for the purpose of acquiring an undivided interest in the Oconee Nuclear Station, Units 1, 2 and 3; that it would contract to sell power from the Oconee Nuclear Station to the eleven cities and towns at cost; and that such an arrangement would result in a lower cost of power to these cities and towns than if they purchased from Duke Power Company at its present wholesale rates.

This Board, by Order entered on August 28, 1967, granted intervention to the eleven cities and towns on the grounds that, as customers of Duke Power Company, they have an economic interest in this proceeding which is a "sufficient interest" to warrant intervention under Section 189 of the Act.

Intervention was denied Piedmont Cities Power Supply, Inc. in that it does not have such an interest; it seeks only to acquire an interest.

By separate Order issued August 28, 1967, this Board held that the application with respect to Oconee Nuclear Station Units 1 and 2, was properly filed under Section 104b of the Act. The intervenors' motion to dismiss the application respecting these units was therefore denied. The Board felt, however, that it could not make a determination of whether the application with respect to Oconee Nuclear Station, Unit 3, was properly filed under Section 104b until further data were available. A decision on the motion to dismiss the application respecting that unit was accordingly deferred.

The rulings of the Board with respect to the motion to dismiss the application were referred to the Commission for review in accordance with Section 2.730(f) of the Commission's Rules of Practice. By Memorandum and Order dated September 8, 1967, the Commission affirmed the Board's denial of the motion to dismiss the application with respect to Oconee Units 1 and 2 and the Board's deferral of the motion to dismiss the application with respect to Oconee Unit 3. The Commission believed it appropriate to reserve a decision on Unit 3 until a review of the Board's initial decision.

On August 29, 1967 the Staff filed a motion with the Commission moving that the Commission direct this Board to certify the question "Whether the petition to intervene filed by the petitioners herein should be granted". On or about September 5, 1967 Piedmont Cities Power Supply, Inc. filed a motion with the Commission moving that this Board be ordered to certify to the Commission the matter of the Board's denial of the right of Piedmont Cities Power Supply, Inc. to participate by intervention in this proceeding,

and that the Order of this Board be reversed. By Order dated September 15, 1967 the Commission denied both the motion of the Staff and the motion of Piedmont Cities Power Supply, Inc. without prejudice to the filing of appropriate exceptions in accordance with 10 CFR Part 2 following the issuance of the Board's initial decision.

6. The proceeding is a "contested proceeding" under Section 2.104 of the Commission's Rules of Practice.

7. Pursuant to the notice of hearing and in accordance with the requirements of the Act and the Commission's Regulations, a pre-hearing conference was held by this Board in the Oconee County Courthouse, Walhalla, South Carolina, on August 15, 1967. A public hearing was held by this Board on August 29 - 30 and September 12, 1967, to consider the issues specified for a contested proceeding and to consider the further question raised by the Intervenors as to whether the application with respect to Oconee Nuclear Station, Unit 3, was properly filed under Section 104b of the Act. Evidence was introduced at the hearing by the Applicant, by the Staff and by the Intervenors. A number of persons made limited appearances.

8. The Applicant is an electric utility corporation that is soundly financed, and has plentiful resources at its command. Its financial position compares favorably with those of the electric utilities industry as a whole. (Lovejoy Testimony, p. 5; T. p. 430 et seq.) Its current Dun and Bradstreet credit rating is the highest (Aa A1) and Moody's Investors Service rates the Company's first mortgage bonds (88.4% of the long-term debt) as Aaa and sinking fund debentures (11.6% of the long-term debt) as Aa.

It plans to finance the cost of construction of the proposed facilities in the same manner as it finances the construction of conventional plants. The estimated construction costs for the three Oconee nuclear units, including the initial cost of fuel, will be $341,000,000. Approximately 35 - 40 percent will come from internal sources and the balance will be financed from outside sources. (Frazer Testimony, p. 3; T. p. 327). The Oconee Nuclear Station is a part of the overall construction program of Duke Power Company and the financing cannot be segregated. The total construction expenditures by the Applicant for the next five years are estimated at $820,000,000. The Applicant estimates that the financing required for these expenditures will consist of about $295,000,000 from internal sources (primarily depreciation funds), about $400,000,000 from the sale of bonds, and about $125,000,000 from the sale of Preferred and Common stock. (Frazer Testimony, p. 3; T. p. 327).

9. The Applicant is responsible for the overall design and construction of the Oconee units. The Bechtel Corporation has been retained to render general consulting services throughout design and construction, and to perform the design of the reactor buildings. (Lee Testimony, p. 10; T.p. 274). The Babcock & Wilcox Company (B & W) will design, manufacture and deliver to the site the three complete nuclear steam supply systems, fuel, and associated engineered safeguards systems (Lee Testimony, p. 9; T. p. 273). Duke Power Company is purchasing and constructing the Oconee Nuclear Station in the same manner as it handles its conventional units - be they fossil fueled or hydroelectric. Duke Power Company has had extensive experience in the design and construction of large electrical supply systems (Lee Testimony, pp. 7 and 9; T. pp. 271 and 273; Safety Evaluation, p. 74).

10. The Oconee Nuclear Station site is on the shore of Lake Keowee, now under construction in Oconee County in the northwestern part of South Carolina. Oconee Station will be a part of the Keowee-Toxaway Project which includes two hydroelectric plants now under construction and future thermal and pumped-storage electric generating developments. The station will have a one-mile exclusion radius and will be in an area remote from population centers. All property within the one-mile exclusion radius is under Duke control, either owned, under option, or covered by an easement granting to Duke the control of access and use when necessary. The site is characterized by sound, hard rock foundations for structures; freedom from flooding; an abundant supply of cooling water from Lake Keowee; an on-site hydroelectric station capable of supplying emergency power; and favorable conditions of hydrology, geology, seismology and meteorology. The nearby Keowee hydro plant tailrace offers the capability of providing emergency water flow by gravity through the Oconee condensers. (Lee Testimony, pp. 6 and 7; T. p. 270; Safety Evaluation, pp. 3-7).

11. The three Oconee Nuclear Units are planned for operation in 1971, 1972 and 1973. The reactors are similar in concept to others now in operation, under construction, or recently licensed by the Commission. (Partial Summary, p. 1). It is expected that each reactor will operate initially at core power levels up to 2452 thermal megawatts, and all physics and core and thermal hydraulics information submitted in support of the Application is based on a core design for nominal operation at that level. It is expected, however, that each unit will be capable of ultimate nominal operation at a core power of 2568 thermal megawatts. The facility systems, engineered

safeguards and containment are designed consistent with safe operation at this higher power level. (Lee Testimony, pp. 3 and 4; T. p. 267). Before operation at any power level above 2452 Mw(t) is authorized by the Commission, the Commission must perform a safety evaluation to assure that the core can be operated safely at the higher power level. (Safety Evaluation, p. 1).

12. The reactors will be fueled with slightly enriched uranium dioxide pellets contained in zircaloy tubes. Control of reactivity will be provided by a combination of dissolved neutron absorber and movable control rods. The neutron absorber, boric acid, is dissolved in the reactor coolant for the purpose of controlling the long-term reactivity of the core and cold shutdown. Silver-Indium-Cadmium control rods clad in stainless steel are employed to control short-term changes in reactivity and to provide fast shutdown capability. (Lee Testimony, p. 4; T. pp. 267-268; Safety Evaluation, pp. 8 - 9).

13. Incore instrumentation, consisting of self-powered neutron detectors, will be located at pre-selected locations within the core. (Safety Evaluation, p. 9). This instrumentation will allow confirmation of reactor design parameters by monitoring core performance. The fuel core will be supported within a heavy-walled steel reactor vessel, through which water will be pumped to remove heat generated in the core. This thermal energy will be transferred to two once-through steam generators for each unit. (Safety Evaluation, p. 9; Partial Summary, p. 10). The steam produced will be used to drive a conventional turbine-generator outside the containment building (Safety Evaluation, p. 10), and will generate initially about 839 megawatts of electricity. Ultimately, it is expected that each unit will have a

net electrical capability of about 874 megawatts. (Lee Testimony, p. 4, T. p. 268).

14. There are numerous systems, components and features incorporated into the station to protect the public. (Partial Summary, p. 11, et seq.). The first line of protection against the release of fission products from the reactors is the fuel itself, which has a high capability for retaining fission products within its own structure. In turn, the fuel pellets are encased in metal tubes which are designed to withstand greater temperatures and pressures than those to which they will be subjected and to prevent the escape of fission products. However, even if some of the fuel rods should fail and permit escape of fission products, they would be contained by the reactor coolant system which consists of closed loops also acting as a barrier. (Lee Testimony, pp. 4 and 5; T. pp. 268 and 269).

15. The engineered safeguards systems (Partial Summary, p. 12 - 14) are designed to protect against the consequences of failures in the reactor system from very small breaks up to the complete double-ended severance of the largest reactor coolant pipe in the system (36-inch ID pipe). Engineered safeguards include systems to prevent the release of fission products from the fuel to the reactor building atmosphere; systems to reduce the pressure in the reactor building and thereby reduce leakage of fission products from the building; and systems to collect and filter leakage from the reactor building penetrations following an accident.

Protection is provided by supplying adequate cooling water to the core to prevent excessive overheating of the fuel rods and subsequent release of the contained fission products. This cooling water is provided by three

engineered safeguards systems. A high pressure injection system supplies low temperature, borated water to the reactor coolant system at any pressure up to full operating pressure. This system, which is normally in operation to supply seal injection and makeup water, will protect the reactor system against small failures. Two pressurized core flooding tanks automatically discharge borated water directly to the reactor vessel if the reactor system pressure falls below 600 psig, and a low pressure injection system supplies borated water to remove decay heat from the reactor following an accident. These latter two systems afford protection against the larger reactor coolant system failures. The pressure in the reactor building following a loss-of-coolant accident is limited by two separate and independent heat removal systems. One system contains three separate fan and cooler units. The other system contains redundant spray headers which spray low temperature borated water into the reactor building atmosphere to cool it. Each of these systems without the other has the heat-removal capability of maintaining the reactor building pressure below its design pressure level. (Partial Summary, pp. 12 - 14; Safety Evaluation, pp. 50 - 53, 55).

16. As still a further containment, the reactor building encloses and contains the entire reactor coolant system to prevent the release of radioactive fluids and vapors to the environment in the remote event of an accident. In the Oconee Station each of the three reactor coolant systems will be housed in its own prestressed, post-tensioned concrete containment building in the shape of a cylinder. The inside diameter of each building is 116 feet and the inside height will be 206 feet. Each containment building will rest on an integral reinforced concrete base slab approximately 8-1/2 feet

thick. The vertical walls will be approximately 3-3/4 feet thick and the dome approximately 3-1/4 feet thick. Each building will be lined with 1/4 inch welded steel plate to provide vapor tightness. Each reactor building containment is designed to limit radioactivity release in the event of an accident to values well below the guidelines established by the Atomic Energy Commission. (Lee Testimony, pp. 5 and 6; T. p. 269; Safety Evaluation, pp. 37, 64-69; Partial Summary, pp. 11-12).

17. The nuclear steam supply system for each of the Oconee units is similar in concept to several projects already in operation, under construction, or recently licensed by the Atomic Energy Commission. The preliminary design is based on the technical data which have been developed in the nuclear industry and on data developed by B & W which is specifically related to the Oconee design. To complete the final detail design of some components, additional technical information will be obtained. (Partial Summary, p. 22).

The following are the areas of plant design in which additional technical data will be developed to finalize design details:

A. Once-through Steam Generator

Steady-state conditions and operational transients will be investigaged in conjunction with the control system to be used for the once-through steam generator. Vibration tests, including steam generator response to primary system blowdown, will be investigated and the thermal response to both primary and secondary blowdowns determined.

B. Control Rod Drive Unit Test

Prototype tests on the control rod drives will be conducted under operating temperature, pressure, flow and water chemistry to provide information on the operability and reliability of the system.

C. In-core Neutron Detectors

The self-powered in-core neutron detectors are currently under test in the Big Rock Point Nuclear Power Plant.

D. Thermal and Hydraulic Programs

The Applicant has proposed scaled flow distribution tests on the vessel and internals and rod bundle tests to determine local mixing and flow effects. Further experimental and analytical work will be done to determine the limiting heat fluxes at various positions within the fuel bundle.

E. Emergency Core Cooling

The Applicant will include emergency core cooling in the development program. Specifically (a) the completion of the analysis of the spectrum of break sizes in the loss-of-coolant accident, (b) the development of the analytical techniques for determining blowdown forces on reactor internals, and (c) demonstration that the injection coolant will cool the core including consideration of core bypass or formation of a vapor lock.

F. Xenon Oscillations

The Applicant plans to further develop analytical techniques to determine whether xenon oscillations can occur. If oscillations are possible a system for controlling the oscillations will also have to be developed.

(Safety Evaluation, pp. 72-73)

18. By Order issued August 28, 1967 this Board held that the Application respecting Oconee Nuclear Station Units 1 and 2, was properly filed under Section 104b of the Act for the reasons that (a) other pressurized water reactors such as the Indian Point No. 2 reactor, and to a lesser degree the San Onofre, the Ginna and the Connecticut Yankee reactors will provide

important operating experience prior to the projected schedule for operation of Oconee Units 1 and 2, but not soon enough to influence major components and thereby change their developmental character, (b) the performance of Unit 1 can have only limited influence on the initial features of Unit 2, and (c) there are associated with the Oconee reactors specific research and development items characteristic of the cases which have been considered to date by the Commission. A decision as to whether the Application respecting Unit 3 was properly filed under Section 104b was deferred pending further data being made available on the question of whether the Applicant has proposed the research and development program required by the Act for its Oconee Unit 3.

On the basis of uncontroverted testimony (Lee Testimony, T.p. 306-308) adduced at the public hearing on August 29-30, 1967, it now appears that the research and development program cited in the Safety Analysis and in the Partial Summary of Application is equally applicable to Units 1, 2 and 3. The conclusions that will be reached as a result of that program must be committed to the manufacture of hardware and equipment for Unit 3. Unit 1 will not have come into service and will not have demonstrated its operating economics before Unit 3 is in a very advanced stage of construction. In order for Unit 3 to be available for operation by the hot weather load period of June, 1973, the Applicant has already had to make commitments for major equipment for Unit 3, including the nuclear steam supply system and the turbine generator. Neither the operation of other pressurized water reactors of the type proposed by the Applicant nor the performance of Oconee Units 1 and 2 will influence major components of Unit 3 or the research and development program applicable to it.

The reactors planned for the Oconee Station are larger in capacity by a factor of more than four than the largest pressurized water reactor operational today. (Long Testimony, T. pp. 411-412). At least until reactors of comparable size have demonstrated by operation their technical feasibility and economic competitiveness with other types of generating facilities, the Oconee reactors must be considered "developmental". No evidence was adduced at the public hearing which would tend to establish that any pressurized water reactor of the type and size of the Oconee reactors will demonstrate technical feasibility and economic competitiveness prior to planned operation of Oconee Nuclear Station, Unit 3.

CONCLUSIONS

Upon the basis of the consideration of the entire record in this proceeding, and in the light of the findings and discussions hereinabove set out, this Atomic Safety and Licensing Board decides and finds that:

1. In accordance with the provisions of 10 CFR §50.35(a),

   a. The Applicant has described the proposed design of the Oconee Nuclear Station, Units 1, 2 and 3, including, but not limited to, the principal architectural and engineering criteria for the design and has identified the major features or components incorporated therein for the protection of the health and safety of the public;

   b. Such further technical or design information as may be required to complete the safety analysis and which can reasonably be left for later consideration, will be supplied in the final safety analysis reports;

c. Safety features or components, if any, which require research and development have been described by the Applicant and the Applicant has identified, and there will be conducted, a research and development program reasonably designed to resolve any safety questions associated with such features or components; and

d. On the basis of the foregoing, there is reasonable assurance that (i) such safety questions will be satisfactorily resolved at or before the latest date stated in the application for completion of construction of the proposed facilities and (ii) taking into consideration the site criteria contained in 10 CFR Part 100, the proposed facilities can be constructed and operated at the proposed location without undue risk to the health and safety of the public.

2. The Applicant is technically qualified to design and construct the proposed facilities; and

3. The Applicant is financially qualified to design and construct the proposed facilities; and

4. The issuance of a permit for the construction of the facilities will not be inimical to the common defense and security or to the health and safety of the public.

5. Oconee Nuclear Station Unit 3, is a "developmental" reactor to the same extent as Units 1 and 2, there being no evidence that the operation of any other reactors will influence its characteristics or major components; and the application respecting Unit 3 was properly filed under Section 104b of the Act.

THEREFORE, PURSUANT TO THE ACT AND THE COMMISSION'S REGULATIONS, IT IS ORDERED THAT:

1. The motion of the Intervenors to dismiss the application with respect to Oconee Nuclear Station Unit 3 is denied;

2. Subject to review by the Commission upon its own motion or upon the filing of exceptions in accordance with the "Rules of Practice", 10 CFR Part 2, the Director of Regulation is authorized to issue to Duke Power Company provisional construction permits for Oconee Nuclear Station Units 1, 2 and 3 pursuant to Paragraph 104b of the Act substantially in the form of Appendix A to the Notice of Hearing in this proceeding, within 10 days from the date of issuance of this decision;

3. In accordance with Paragraph 2.764, good cause not having been shown to the contrary, this initial decision shall be immediately effective.

ATOMIC SAFETY AND LICENSING BOARD

_____
Dr. John Henry Buck

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Dr. Hugh Paxton

_____
Mr. Samuel W. Jensch

Dated this _____ day of October, 1967