DOCKET NUMBER
PROD. & UTIL. FAC. 50-302

UNITED STATES OF AMERICA

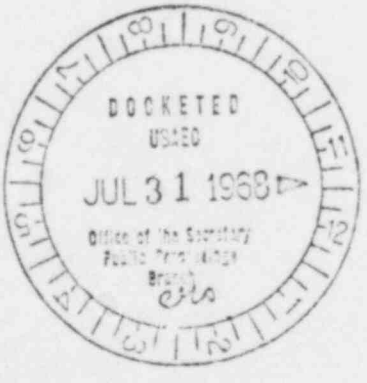
ATOMIC ENERGY COMMISSION

In the Matter of	)	
	)	
FLORIDA POWER CORPORATION	)	DOCKET NO. 50-302
	)	
(Crystal River Unit 3 Nuclear Generating Plant)	)	

In compliance with directions of the Atomic Safety and Licensing Board at the public hearing in the captioned matter at Crystal River, Florida on July 16 and 17, 1968, and in accordance with Section 2.754 of the Commission's "Rules of Practice", 10 CFR Part 2, the Applicant, Florida Power Corporation, respectfully submits the attached proposed findings of fact and conclusions of law in the form of a proposed initial decision.

This 29th day of July, 1968.

Respectfully submitted,



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July 29, 1968

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the Matter of	)	
	)	
FLORIDA POWER CORPORATION	)	DOCKET NO. 50-302
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(Crystal River Unit 3 Nuclear Generating Plant)	)	

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

Statement of the Proceeding

1. This proceeding involves the license application filed by Florida Power Corporation (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 a closed cycle pressurized water reactor, to be known as Crystal River Unit 3 Nuclear Generating Plant, to operate initially at 2452 thermal megawatts and to be located directly on the Gulf of Mexico, in the Northwestern extremes of Citrus County, Florida, approximately 7½ miles Northwest of the Town of Crystal River and 70 miles from Tampa, Florida (Summary, pp. 1, 3 and 4; Safety Evaluation, pp. 1 and 4).

* In this document, the transcript is cited as "T.p. ____", the Applicant's Summary Description of Application (T.p. 264 et seq.) as "Summary", the Staff's Safety Evaluation (T.p. 276 et seq.) as "Safety Evaluation", and the Application, as supplemented and amended (T.p. 222 et seq.) as "Application".

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 a construction permit (Safety Evaluation, pp. 65 and 66). The Application was also reviewed by the Advisory Committee on Reactor Safeguards which concluded that the Crystal River Unit 3 Nuclear Generating Plant 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 May 29, 1968, 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 a provisional construction permit should be issued to the Applicant (33 FR 8235).

4. On April 29, 1968, the State of Florida 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 this Atomic Safety and Licensing Board at the prehearing conference held on June 19, 1968. The State of Florida did participate in the proceedings by the presentation of unsworn statements by several State officials at the public hearing on July 16, 1968 (T.p. 188 et seq.). All of such statements supported the Application of Florida Power Corporation.

5. On June 14, 1968, the City of Gainesville, Florida, and the Gainesville Utilities Department (collectively called "Gainesville") filed a Petition for Leave to Intervene and a Motion to Broaden the Issues. Gainesville rested its standing to intervene in the proceeding upon its

expectation of becoming a customer of the Applicant pursuant to a pending and disputed order of a Federal Power Commission Presiding Examiner. Gainesville alleged that the Commission lacked jurisdiction to grant Applicant a license under Section 104b of the Act because the facility was not an experimental reactor but that it had commercial value. Gainesville also attempted to broaden the issues to include its right to a share of the ownership of the proposed nuclear facility, whether it had practical value and hence should be licensed under Section 103 of the Act, and that the Commission should consider anti-trust matters. The Applicant filed its Answer in opposition to Gainesville's Petition and Motion vigorously denying Gainesville's present standing to intervene and further denying the legal sufficiency of Gainesville's Petition. The Staff filed its Answer opposing the Motion to Broaden the Issues but consenting to Gainesville's intervention, limited to the proposed contesting of the jurisdictional issue of whether or not the Commission could lawfully issue a construction permit for the proposed facility under Section 104b of the Act.

6. On Jun 28, 1968, this Atomic Safety and Licensing Board entered its Order denying Gainesville's Motion to Broaden the Issues, but granted the Petition to Intervene, limited to the issue whether the nuclear reactor facility proposed to be constructed and operated by Florida Power can be authorized pursuant to Section 104b of the Act.

7. The proceeding is a "contested proceeding", as defined by Section 2.4(n) of the Commission's "Rules of Practice".

8. Pursuant to the Notice of Hearing and in accordance with the requirements of the Act and the Commission's Regulations, a prehearing conference was held by this Board in the Crystal River Elementary School Auditorium,

Crystal River, Florida, on June 19, 1968. A public hearing was held by this Board on July 16 and 17, 1968, to consider the issues specified for a contested proceeding and to consider the further question raised by the Intervenor as to whether the Application was properly filed under Section 104b of the Act. Evidence was introduced at the hearing by the Applicant and by the Staff. The Intervenor presented no direct evidence other than a copy of a letter dated April 18, 1968, from the Applicant to the Division of Reactor Licensing, pertaining to Applicant's request for an exemption from the provisions of Section 50.10(b) pursuant to Section 50.12 of the Commission's "Rules of Practice". A number of persons made limited appearances.

Findings of Fact

9. The Applicant is an electric utility corporation that is soundly financed and has the financial qualifications to construct and operate the Crystal River Nuclear Plant. Its financial position compares favorably with those of the electric utility industry as a whole. Its current Dun and Bradstreet credit rating is the highest (AaA1) and Moody's Investors Service rates the Company's first mortgage bonds as Aa (high grade), and its convertible debentures A (high-medium grade). (Loader Testimony, T.pp. 230 and 231).

10. It plans to finance the cost of construction of the proposed facility as an integral part of its normal construction program for plants and necessary attendant facilities through the use of funds internally generated and from funds derived from the sale of various senior securities in the same general manner as it finances the construction of conventional plants. The estimated construction costs for the Crystal River Unit 3

Nuclear Generating Plant, including the initial cost of fuel, will be $126,000,000. Approximately 45 percent will come from internal sources and the balance will be financed from the sale of securities (Loader Testimony, T.pp. 229 and 230). The total construction expenditures by the Applicant for the five-year period 1968 - 1972, including the cost of nuclear fuel, are estimated at $365,000,000 (Loader Testimony, T.p. 229).

11. The Applicant is responsible for the overall design and construction of the Crystal River Unit 3 Nuclear Generating Plant. Gilbert Associates, Inc., has been retained to render general consulting services throughout design and construction, and to perform the design of the reactor building (Rodgers Testimony, T.pp. 254 and 255). The Babcock & Wilcox Company (B & W) will design, manufacture, deliver and erect a complete nuclear steam supply system, associated engineered safeguards systems, and fabricate its fuel elements (Rodgers Testimony, T.p. 253). Florida Power Corporation is purchasing and constructing the Crystal River Unit 3 Nuclear Generating Plant in the same manner as it handles its conventional fossil-fueled units. Florida Power Corporation has had extensive experience in the design and construction of large electrical supply systems (Rodgers Testimony, T.pp. 250 and 251; Safety Evaluation, p. 48). The Applicant's program to assure that very high standards of quality control are maintained and accomplished by the manufacturers of all components of its nuclear steam supply system, as well as by all contractors performing erection work at the site, is the most comprehensive and elaborate such program to be stated for the record (T.pp. 435 - 443, and 462 - 471).

12. The Crystal River Unit 3 Nuclear Generating Plant site is directly

on the Gulf of Mexico, in the northwestern extremes of Citrus County, Florida. The Crystal River Unit 3 Nuclear Generating Plant will be a part of the Crystal River Project which includes one coal-fired plant now in service and a second coal-fired plant under construction. The station will have a 4,400-foot exclusion radius and will be in an area remote from population centers. All property within the 4,400-foot exclusion radius is owned in fee simple by and is under Florida Power's complete and full control. The site is characterized by underlying limerock which is geologically competent to support the loads to be imposed upon it; freedom from flooding; an abundant supply of cooling water from the Gulf of Mexico; an on-site fossil-fueled station capable of supplying emergency power; and favorable conditions of hydrology, geology, seismology and meteorology (Rodgers Testimony, T.pp. 248 and 249; Safety Evaluation, pp. 4 - 8).

13. The Crystal River Unit 3 Nuclear Generating Plant is planned for operation in 1972. The reactor is similar in concept to others now in operation, under construction, or recently licensed by the Commission (Summary, p. 2). It is expected that the reactor will operate initially at a core power level 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 the nuclear steam supply system will be capable of ultimate nominal operation at a core power of 2560 thermal megawatts (including 16 MWt contribution from the reactor primary coolant pumps). The facility systems, engineered safeguards and containment are designed consistent with safe operation at this ultimate power level (Rodgers Testimony, T.p. 245). Before operation at any power level above

2452 MWt 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).

14. The reactor will be fueled with slightly enriched uranium dioxide pellets contained in zircaloy tubes. Control of reactivity will be provided by a combination of 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 changes of the core and provide cold shutdown. Silver-Indium-Cadmium control rods clad in stainless steel are employed to control short-term changes in reactivity levels and to provide fast shutdown capability (Rodgers Testimony, T.pp. 245 and 246; Safety Evaluation, pp. 9 - 10).

15. Incore instrumentation, consisting of self-powered neutron detectors, will be located at pre-selected locations within the core (Rodgers Testimony, T.p. 246; 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 (Rodgers Testimony, T.p. 246; 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 855 megawatts of electricity. Ultimately, it is expected that the unit will have a gross electrical capability of about 885 megawatts (Rodgers Testimony, T.p. 246).

16. There are numerous systems, components and features incorporated

into the station to protect the public (Summary, pp. 12 - 20). The first line of protection against the release of fission products from the reactors is the fuel pellets themselves, with their high capability for retaining fission products within their own physical structure. The fuel pellets are inserted in zirconium metal tubes which are designed and selected to withstand without failure much higher temperatures and pressures than those to which they will be subjected, thus preventing the escape of fission products. In the unlikely event of fuel tube failure for whatever cause with a release of any contained fission products, these fission products would remain within the liquid reactor coolant system contained in the primary coolant piping loops all of which are within the reactor building containment structure (Rodgers Testimony, T.pp. 246 and 247).

17. The engineered safeguards systems are designed to protect against the consequences of failures in the reactor system from very small breaks up to the complete double-ended rupture of the largest reactor coolant pipe in the system (36-inch ID pi). 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 (Summary, pp. 13 - 14).

18. 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 product . 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 (Summary, pp. 13 - 14; Safety Evaluation, pp. 38 - 43).

19. 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 Crystal River Unit 3 Nuclear Generating Plant the reactor coolant system will be housed in a prestressed, post-tensioned concrete reactor containment building in the shape of a cylinder. The inside diameter of the building is 130 feet and the inside height will be 187 feet. The reactor containment building will rest on an integral reinforced concrete slab approximately 10 feet thick. The vertical walls will be approximately 3-1/2 feet thick and the dome approximately 3-1/4 feet thick. The building will be lined internally with 3/8 inch welded steel plate to provide

vapor tightness. The reactor building containment structure is designed to limit radioactivity release, in the event of an accident, to values well below 10 CFR 100 guidelines published by the Atomic Energy Commission in the Federal Register (Rodgers Testimony, T.pp. 247 and 248; Safety Evaluation, pp. 29, 51 - 57; Summary, pp. 12 - 13).

20. The nuclear steam supply system for the Crystal River Unit 3 Nuclear Generating Plant 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 Crystal River Plant Unit 3. To complete the final detail design of some components, additional technical information will be obtained (Summary, p. 22).

21. The following are the areas of plant design which (under the Commission's definition) require research and development in order to produce additional technical data which will be utilized to finalize design details:

A. Once-through Steam Generator

Steady-state conditions and operational transients will be investigated 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 small 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. Fuel Rod Failure

The Applicant plans to further develop the various failure modes of the fuel rods during the loss-of-coolant accident, such as clad melting, eutectic formation, bulging, splitting, or brittle failure, will be examined in an experimental program to assure the continued core cooling capability during a loss-of-coolant accident.

G. 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.

H. Iodine Removal System

The research and development program of the Applicant includes studies on decomposition under normal and accident conditions, materials compatibility, iodine removal characteristics, and compatibility with boron compounds. Also included will be parallel tests on alternate chemical solutions, and tests on spray efficiency during conditions of spray water hotter than ambient atmosphere.

(Summary, pp. 22 - 25; Safety Evaluation, pp. 58 - 60; T. pp. 315 - 347).

22. At the prehearing conference the Board directed a number of questions and concerns to the Applicant and the Regulatory Staff (T.pp. 66 - 86).

At the public hearing held in Crystal River, Florida, on July 16 and 17, 1968, the Applicant and the Staff were most responsive to the Board's questions and concerns. The Board's inquiries were satisfied and it finds that the answers and responses given by the Applicant and the Staff were as complete and thorough as reasonably possible at the construction permit stage of the licensing procedures contemplated by the Atomic Energy Act of 1954, as amended, and the Commission's Rules and Regulations. The specific questions and concerns of the Board and the transcript citation to the response of the party answering are as follows:

a. The Board inquired of the Regulatory Staff as to those factors they considered in concluding that design-basis accident doses would be within Part 100 Guidelines. The Board finds that the factors considered by the Staff adequately support its conclusion that design-basis accident doses will be within Part 100 Guidelines (T.pp. 312 - 314).

b. The Board asked the Applicant to describe at the public hearing the current status of the research and development items described in the Application. The Board finds that the Applicant has satisfactorily responded to this inquiry (T.pp. 315 - 347).

c. The Board asked the Applicant to respond to its concern regarding operating temperatures of pressurized water reactors. The Board finds that the Applicant has satisfactorily responded to this inquiry (T.pp. 347 - 358).

d. The Board asked the Staff to respond to the Board's concern with the use of sodium thiosulphate sprays to

remove iodine from the containment building atmosphere and the possible decomposition of the sodium thiosulphate. The Board finds that the Staff has satisfactorily responded to this inquiry (T.pp. 358 - 364 and 471 - 478).

e. The Board asked the Staff to respond to the Board's concern with organic iodine fractions, the amount of iodine which is non-removable, and the effect on off-site doses of iodine. The Board finds that the Staff has satisfactorily responded to this inquiry (T.pp. 364 - 378).

f. The Board inquired of the Staff whether or not there was any problem arising out of using a low population zone of five miles, and from the fact that the nearest population center of 25,000 persons or more is fifty-five miles away. The Board finds that the Staff has satisfactorily responded to this inquiry (T.pp. 401 - 403).

g. The Board asked the Applicant to respond to the Board's concern with the foundation grouting program of the nuclear plant. The Board finds that the Applicant has satisfactorily responded to this inquiry (T.pp. 403 - 409).

h. The Board requested the Applicant to respond to the Board's concern with the chloride stress corrosion and the use of stainless steel in the nuclear facility. The Applicant's response to this concern has been satisfactory (T.pp. 409 - 411 and 468 - 471).

i. The Board asked the Applicant to respond to its concern regarding the experience of the J. A. Jones Construction Company at Oyster Creek. The Board finds that the Applicant has satisfactorily responded to this inquiry (T.pp. 411 - 414).

j. The Board asked the Staff to respond to its questions regarding the testing of cooling fan motors. The Board finds that the Staff has satisfactorily responded to this inquiry (T.pp. 414 - 420).

k. The Board asked the Staff for its comments with regard to the Fish and Wildlife Service's suggested monitoring program in Appendices H-1, H-2 and H-3 to the Safety Evaluation. The Board finds that the Staff's comments are satisfactory (T.pp. 420 - 431).

l. The Board asked the Applicant for its comments with regard to the possible use of filters in lieu of a spray system to reduce releases of iodine. The Board finds that the Applicant's response to this inquiry is satisfactory (T.pp. 431 - 435).

m. The Board asked the Applicant to outline for the Board its quality control program and how it would assure itself that the desired results will be had from the components intended to be utilized in the project. The Board finds that the Applicant's response to the inquiry is satisfactory (T.pp. 435 - 443 and 462 - 471).

n. The Board asked the Staff to comment on the building wake factor used in its Safety Evaluation. The Board finds that the Staff's response to this inquiry is satisfactory (T.pp. 444 - 448).

23. With respect to Gainesville's contention that the Commission lacks jurisdiction to license the proposed nuclear facility under Section 104b of the Act, this Board specifically finds that Florida Power has properly and lawfully filed its Application to construct the Crystal River Unit 3 Nuclear Generating Plant under Section 104b of the Act for the reasons that (a) other pressurized water reactors such as the Oconee Units and Three Mile Island will not provide sufficient operating experience prior to the projected schedule for operation of Crystal River No. 3 to influence major components and thereby change their developmental character (Duke Proceedings, Docket No's. 50-269, 50-270 and 50-287, Initial Decision dated November 3, 1967; and See T.p. 289); and (b) there are associated with the Crystal River No. 3 reactor specific research and development items characteristic of the cases which have been considered to date by the Commission. The only evidence on this point that Gainesville adduced in this entire proceeding was in cross-examination of Mr. J. T. Rodgers (T.pp. 301 - 311). Mr. Rodgers stated that he personally believed the nuclear plant would be reliable and that the plant would be vital to Florida Power's electrical system, however, operating difficulties or unforeseen delays would not be fatal to the system's reliability.

24. On the basis of uncontroverted testimony (Wescher Testimony, T.pp. 315 - 347) adduced at the public hearing on July 16 and 17, 1968, it now appears that the research and development program cited in the

Safety Evaluation and in the Summary Description of Application, while similar in many respects to that of the Oconee Units and Three Mile Island, is equally applicable to Crystal River Unit 3. The conclusions that will be reached as a result of the research and development program must be committed to the manufacture of the nuclear steam supply system for Crystal River Unit 3 long before the Oconee Units and Three Mile Island will have come into service and they will not have demonstrated any operating economies or competitiveness with conventional generating plants before Crystal River Unit No. 3 is in a very advanced stage of construction. In order for the Crystal River Unit No. 3 to be available for operation as scheduled during 1972, the Applicant has already had to make commitments for major equipment for said unit, including the nuclear steam supply system and the turbine generator. The operation and limited performance experience of other similar pressurized water reactors, such as Oconee No. 1 and Three Mile Island, will not influence the major components of Crystal River Unit 3 or the research and development program applicable to it (Summary, p. 2).

25. The construction and operation of the proposed facility will provide information bearing upon whether or not the type of pressurized water reactor has practical value for industrial or commercial purposes, such information relating to design and construction at an economic cost; the achievement of full power output, continuity of service and load carrying capability on electric systems, and the technical and economic operation of the nuclear fuel cycle in connection with such facility.

26. The reactor planned for the Crystal River Unit No. 3 Nuclear Generating Plant is larger in capacity by a factor of approximately two

than the largest pressurized water reactor operational today. At least until reactors of comparable size have demonstrated by operation their reliability, technical feasibility and economic competitiveness with other types of generating facilities, the Crystal River Unit No. 3 reactor 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 Crystal River reactor will demonstrate technical feasibility and economic competitiveness prior to planned operation of Crystal River Unit No. 3 Nuclear Generating Plant.

27. The activities to be conducted under the permit applied for will be within the jurisdiction of the United States, and all of the Directors and principal officers of the Applicant are United States citizens. The Applicant is not owned, controlled or dominated by any alien, foreign corporation or foreign government (See Application for Licenses, Item No. 1 of Joint Exhibit A, T.p. 222; Loader Testimony, T.p. 234).

Conclusions

Upon 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 has concluded that:

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

    a. The Applicant has described the proposed design of the Crystal River Unit 3 Nuclear Generating Plant, 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 report;

c. Safety features or components 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 facility and (ii) taking into consideration the site criteria contained in 10 CFR Part 100, the proposed facility 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 facility;

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

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

5. A. The Crystal River Unit No. 3 Nuclear Generating Plant is a "developmental" reactor to the same extent as the Oconee Units and Three Mile Island. There is no evidence that the operation of these or any other reactors will have a major influence on its design characteristics or major components;

B. Under the statutory language and the Commission's construction of it in its Memorandum and Order dated December 5, 1967, in Matter of Philadelphia Electric Company, and in its Decision of January 3, 1968, in the Duke Power Company case, and more recently in its Decision of June 5, 1968, in the Philadelphia Electric Company case, the proposed facility here is a utilization facility involved in the conduct of research and development activities leading to the demonstration of the practical value of such type of facility for industrial or commercial purposes. There is substantial and uncontradicted evidence in the record reflecting:

(1) A number of aspects of research and development needed to complete the design of certain components for the Crystal River Unit No. 3 Nuclear Generating Plant (Findings of Fact No. 21), and

(2) That the construction and operation of the proposed facility will provide information demonstrating whether or not this type of pressurized

water reactor has practical value for commercial or industrial purposes (Findings of Fact No. 25);

C. The Applicant has sustained its burden of proof as to the jurisdiction of the Board and all other matters pertinent to its Application; and

D. The Application is properly filed under and licenses may be issued under Section 104b of the Atomic Energy Act of 1954, as amended.

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

1. 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 directed to issue to Florida Power Corporation a provisional construction permit for Crystal River Unit No. 3 Nuclear Generating Plant 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; and

2. In accordance with 10 CFR 82.764, good cause not having been shown to the contrary, this initial decision shall be immediately effective.

ATOMIC SAFETY AND LICENSING BOARD

Dated this _____ day of

_____, 1968.

_____
Dr. Eugene Greuling

_____
Dr. Hugh C. Paxton

_____
Mr. Samuel W. Jensch

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the Matter of	)	
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FLORIDA POWER CORPORATION	)	Docket No. 50-302
	)	
(Crystal River Unit 3 Nuclear Generating Plant)	)	

PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW SUBMITTED BY THE STAFF IN THE FORM OF A PROPOSED INITIAL DECISION

Statement of the Proceedings

1. This proceeding involves the application of Florida Power Corporation (Applicant), dated August 10, 1967, and five amendments thereto, dated respectively January 15, 1968, February 7, 1968, March 1, 1968, March 11, 1968, and April 8, 1968, (hereinafter collectively referred to as "the application") filed under § 104 b. of the Atomic Energy Act of 1954, as amended (the "Act"), for a construction permit to construct a pressurized water reactor, designed to operate initially at power levels up to 2452 megawatts (thermal), to be located on the Applicant's 4,738 acre site located on the Gulf of Mexico about 70 miles north of Tampa, Florida, and seven and one-half miles north of the Town of Crystal River, Florida. (Safety Evaluation, p. 2; Joint Exhibit A.)

2. The application was reviewed by the regulatory staff (staff) of the Atomic Energy Commission (Commission) which concluded that the

proposed facility can be constructed at the proposed site without undue risk to the health and safety of the public. (Safety Evaluation, p. 66.) The application was also reviewed by the Advisory Committee on Reactor Safeguards which concluded that the proposed reactor 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 B.)

3. On May 29, 1968, the Commission issued a "Notice of Hearing on Application for a Provisional Construction Permit" in the captioned matter which contained the issues to be considered and initially decided by this Atomic Safety and Licensing Board (the "Board") designated by the Commission to conduct this proceeding as a basis for determining whether a provisional construction permit should be issued to the Applicant. (Safety Evaluation, p. 3; Tr., p. 93.) The Notice of Hearing was published on June 1, 1968, in the Federal Register (33 F.R. 8235).

4. On April 29, 1968, a Notice of Appearance was filed by the State of Florida requesting permission to participate in the proceeding pursuant to § 2.715(c) of the Commission's "Rules of Practice", 10 CFR Part 2. With the consent of the Applicant and the staff, the intervention was allowed.

5. On May 29, 1968, a Petition for Leave to Intervene and Motion to Broaden Issues was filed by the City of Gainesville, Florida, and the Gainesville Utilities Department. The Petition raised several contentions including a challenge to the jurisdiction of the Commission to issue a construction permit under Section 104 b. of the Act. By order of this Board dated June 28, 1968, the Petition to Intervene was granted, limited to the jurisdictional issue, and the Motion to Broaden Issues was denied. As a result of this intervention, the proceeding became a contested proceeding as defined by 10 CFR § 2.4(n).

6. At the hearing, statements were made by Nathaniel P. Reed, on behalf of the Honorable Claude R. Kirk, Jr., Governor of the State of Florida; and by T. T. Turnbull, Esq., Assistant Attorney General of Florida on behalf of the Honorable Spessard L. Holland, U. S. Senator from the State of Florida; George A. Smathers, U. S. Senator from the State of Florida; the Honorable William C. Cramer, Congressman, 8th District of Florida and the Florida Air and Water Pollution Control Commission. Statements were also presented by Randolph Hodges, Director, Florida Board of Conservation; R. W. Wood, Chief, Fisheries Division, Florida Game and Fresh Water Fish Commission; B. Kenneth Catlin, on behalf of the Florida Public Service Commission; Edwin G. Williams, M.D., on behalf of Wilson Souder, M.D., State Health Officer, Florida State Board of Health. Limited appearances, pursuant to the provisions of

10 CFR § 2.715(a) of the Commission's "Rules of Practice", were made by William B. Womack; Howard Zeller, Federal Water Pollution Control Administration; Lowell Bryant, Citrus County, Florida; Kenneth D. Morri , on behalf of the Florida Audubon Society; Robert S. Sholtes, Professor of Environmental Engineering, University of Florida; Mrs. Helen C. Morrison, appearing for Norton L. Holmes; and David A. Gavin, on behalf of the Crystal River Council. (Tr., pp. 112-218.)

7. A Pre-Hearing Conference was held on June 19, 1968, at Crystal River, Florida, and a Hearing was held at the same place on July 16-17, 1968, pursuant to the Notice of Hearing. At the Hearing evidence was presented by the Applicant, the staff and the Intervenor.

Findings of Fact

8. The Applicant is a corporation organized under the laws of the State of Florida and is soundly financed and has significant resources at its command. It plans to finance the cost of construction of the proposed facility as an integral part of its total construction program, namely, in the ordinary course of business through funds derived from operations and through short term borrowings and the issuance and sale of securities. Applicant is financially qualified to design and construct the proposed facility. (Lovejoy testimony, pp. 3-4; Tr., pp. 229-231.)

9. The Nuclear Project Manager for the Crystal River facility is also the Chief Mechanical Engineer of the company and reports directly to the company President. A construction section headed by the Construction Manager is part of the Mechanical Engineering Department and will supervise and coordinate construction of the facility. This section has experience in power plant construction management, having exercised this supervision on all major plants in the FPC system. All supervisory personnel will be men with extensive operating and maintenance experience in fossil-fueled steam-electric plants, and will be given nuclear training. Training will include selected college courses, special nuclear engineering courses conducted by B&W and other courses in reactor operation instruction at the B&W facilities at Lynchburg, Virginia. Operator trainees will spend six months in training at an operating plant. The B&W Company has extensive background in supplying nuclear steam supply systems. Gilbert Associates has been associated with nuclear designs since 1955, including the Metropolitan Edison Three Mile Island and the Rochester Gas & Electric Ginna plant. The J. A. Jones Company, general contractor, has worked for the Atomic Energy Commission in building the gaseous diffusion plant at Oak Ridge and a major part of the Hanford Plant. (Safety Evaluation, pp. 48-49; Tr., pp. 251-255.)

10. The site is on the Gulf of Mexico, about 70 miles north of Tampa, Florida. The site consists of 4,738 acres of land owned by the Applicant. There are no residents within three and one-half miles of the reactor. Within ten miles of the proposed reactor, the population in 1967 was 3,300 and within twenty miles, the population was about 6,000. The nearest population center with more than 25,000 residents (Gainesville, Florida) is fifty-five miles from the site. A significant increase in the five-ten mile zone population density is projected for the 40-year life of the plant primarily as a result of an increase in the population of the Town of Crystal River, from slightly over 3,000 people to over 25,000 people.. The site geology is characterized by limestone which has been subjected to solutioning with resulting voids and channels. The Applicant proposes a consolidation routing program to fill the voids and channels, confine potential settlement-inducing zones, and minimize solution rates. A curtain of grout around the foundation area will control groundwater. This procedure was used successfully during the construction of Unit 2, on the site. (Safety Evaluation, p. 5; Tr., pp. 248-249.)

11. The nuclear steam supply system consists of a light water moderated and cooled pressurized water reactor (PWR) which transfers heat to two once-through steam generators from which steam passes to the turbine generator. The reactor core is comprised of 177 fuel

assemblies containing low-enrichment uranium dioxide pellets within zircaloy tubes. Reactivity control will be accomplished by a combination of 69 control rod cluster assemblies and by liquid poison (boric acid) in the reactor coolant. The 69 control rod assemblies are withdrawn and inserted by a rack and pinion drive assembly. Neutron flux level, high or low reactor system pressure, high coolant temperature, or low coolant flow can initiate a reactor trip through the reactor protection instrumentation which de-energizes the magnetic clutches on the control rods and scrams the reactor. External neutron detectors and 52 in-core detector assemblies will be provided to monitor neutron flux distributions. (Safety Evaluation, pp. 9-10, 17; Tr., pp. 245-246.)

12. The nuclear steam supply system is essentially identical in design to that of the Duke Power Company's Oconee Nuclear Station, Units 1, 2 and 3, and the Metropolitan Edison's Three Mile Island Station, previously authorized for construction by the Commission. (Safety Evaluation, p. 11; Summary, p. 22.)

13. The proposed plant incorporates numerous systems, components, and features for the protection of plant personnel and the public. The containment consists of a steel-lined, prestressed concrete cylinder with a shallow domed roof and a flat foundation slab designed to withstand a containment pressure of 55 pounds per square inch. The con-

tainment structure will have adequate capability for a suitable in-service surveillance program. (Safety Evaluation, pp. 29-30; Tr., pp. 247-248; Summary, pp. 11-12.)

14. Reduction of containment building pressure to assure containment integrity under accident conditions is provided by:

(a) Containment spray pumps which take water initially from the borated water storage tank and then from the containment sump and deliver it to the containment atmosphere through redundant spray headers, and

(b) Three emergency cooling units, each consisting of a fan and a tube cooler for transferring heat from the containment atmosphere to the reactor building emergency cooling system. (Safety Evaluation, pp. 42-44; Summary, pp. 13-14.)

15. The plant design provides protection against clad melting for the entire spectrum of reactor coolant system failures. The protection is provided by the emergency core cooling system which consists of both passive flooding systems and pumping systems. The

The passive flooding system consists of two pressurized core flooding tanks which automatically discharge borated water into the reactor vessel in the event that the reactor system pressure drops below 600 psi. The pumping system consists of two completely independent sub-systems. Each sub-system contains both a high pressure and a low pressure injection pump. Either sub-system, in conjunction with the core flooding tanks, is capable of protecting the core for any size leak up to and including the double-ended rupture of the largest reactor coolant pipe. Either sub-system can supply coolant directly from the borated water storage tank or by recirculation from the Reactor Building sump through heat exchangers which cool it before it is returned to cool the core. (Safety Evaluation, pp. 38-39; Summary, p. 13-14.)

16. An iodine "fixing" additive will be mixed with the containment spray water to remove iodine from the containment atmosphere after a loss-of-coolant accident. Two sprays are provided and either spray has the design capability to remove sufficient iodine from the containment atmosphere to reduce potential doses at the site boundary to Part 100 limits, or less. The Applicant has selected sodium thiosulfate as the additive. However, the research programs also include alternate chemical solutions. While the removal factors needed to meet site guidelines appear to be available under laboratory conditions, the stability and compatibility of the additives under accident conditions

have not yet been proven. The Applicant has outlined a research and development program designed to provide adequate information to justify the use of a chemical spray as an engineered safety feature. (Safety Evaluation, pp. 43-45; Tr., pp. 432-435 and 471-494.)

17. In order to develop the final design of the project, further information and data are needed. Such additional data will be acquired from research and development projects and by evaluation of operating reactor experience concerning the following items:

(a) Once-through steam generator;

(b) Control rod drive unit;

(c) In-core neutron detectors;

(d) Core thermal and hydraulic design;

(e) Emergency core cooling and core barrel check valves;

(f) Xenon oscillation control;

(g) Use of sodium thiosulphate for iodine removal; and

(h) Fuel rod failure mechanisms during LOCA.

Such programs are reasonably designed to resolve any safety questions associated with the features named above and will provide data necessary to construct the proposed facility in accordance with the criteria and specifications set forth in the application. The successful completion

of the research and development program and the construction and operation of the proposed facility will provide information bearing upon its practical value for industrial or commercial purposes. (Safety Evaluation, pp. 58-60; Summary, pp. 22-25; Tr., pp. 288-295.)

18. The application contains a description of the site and the basis for its suitability, a detailed description of the proposed facility including those reactor systems and features which are essential to safety, an analysis of the safety features provided for in the facility design, and an evaluation of various postulated accidents and hazards involved in the operation of such a facility and the engineered safety features provided to limit their effect. Additional testimony and documentary evidence relative to these matters is included in the evidentiary record. Also included in the application is evidence of the financial qualifications of the Applicant and the technical qualifications of the Applicant, including those of its contractors, to design and construct the facility. The staff's review of the application explains the consideration which was given by the staff to the important safety features of the proposed facility and the significance assigned to those systems and features important to the prevention and mitigation of accidents. (Safety Evaluation; Summary of Application; Joint Exhibit A.)

19. The activities to be conducted under the permit applied for will be within the jurisdiction of the United States, and all of the

Directors and principal officers of the Applicant are United States citizens. The Applicant is not owned, controlled or dominated by any alien, foreign corporation or foreign government. (Safety Evaluation, p. 64; Tr., p. 234; Joint Exhibit A, Item I.)

Conclusions

Upon 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 has concluded that:

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

(a) The Applicant has described the proposed design of the facility, 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 be reasonably be left for later consideration will be supplied in the final safety analysis report;

(c) Safety features or components 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 facility, and (ii) taking into consideration the site criteria contained in 10 CFR Part 100, the proposed facility 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 facility.

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

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.A. The proposed Crystal River Unit 3 facility is a utilization facility involved in the conduct of research and development activities leading to the demonstration of the practical value of such facility for industrial or commercial purposes. Memorandum and Order dated December 5, in the Matter of Philadelphia Electric Company; Decision, dated January 3, 1968, in the Matter of Duke Power Company, Docket Nos. 50-269, 50-270 and 50-287; and Decision, dated June 5, 1968, in the Matter of Philadelphia Electric Company, Docket Nos. 50-277 and 50-278. There is substantial evidence in the record reflecting:

(1) A number of aspects of research and development needed to complete the design of certain components for the Crystal River Unit 3 facility, and

(2) That the construction and operation of this utilization facility will constitute a demonstration that will provide a basis for commercial evaluation.

B. The Applicant has sustained its burden of proof as to the jurisdiction of the Board and all other matters pertinent to its application.

C. The application is properly filed under and licenses may be issued under Section 104 b. of the Act.

Order

Pursuant to the Act and the Commission's Regulations, IT IS ORDERED THAT, 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 directed to issue to Florida Power Corporation a provisional construction permit pursuant to Section 104 b. 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. IT IS FURTHER ORDERED, in accordance with 10 CFR § 2.764, good cause not having been shown to the contrary, this initial decision shall be immediately effective.

ATOMIC SAFETY AND LICENSING BOARD

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Dated at Bethesda, Maryland,
this 29th day of July, 1968.