ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

June 7, 1976

Honorable Marcus A. Rowden
Chairman
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: INTERIM REPORT ON FLOATING NUCLEAR PLANT

Dear Mr. Rowden:

During its 194th Meeting, June 3-5, 1976, the Advisory Committee on Reactor Safeguards completed a partial review of the application of Offshore Power Systems (OPS) for a license to manufacture eight standardized Floating Nuclear Plant (FNP) units in a shipyard-like facility located on Blount Island in Jacksonville, Florida. This application was the subject of a Subcommittee meeting in Los Angeles, California, on April 3, 1976, as well as a number of earlier meetings with OPS (the Applicant) and with the Nuclear Regulatory Commission (NRC) Staff. The project was also considered during the 192nd and 193rd meetings of the Committee in Washington, D. C., April 8-10 and May 6-8, 1976, respectively. The Committee had most recently discussed this application in an interim report to the Commission on December 10, 1975. The Committee had earlier commented on the Platform Mounted Nuclear Power Plant in its report of November 15, 1972, and on the FNP concept in connection with the Atlantic Generating Station site in its report of October 18, 1973. During its review, the Committee had the benefit of discussions with the NRC Staff, the U. S. Coast Guard, and representatives and consultants of OPS. The Committee also had the benefit of the documents listed.

As noted in the Committee's Report of December 10, 1975, the FNP will make use of the Westinghouse RESAR-3 Consolidated Version four-loop pressurized water nuclear reactor having a core power output of 3411 MWt. This reactor design is similar to that utilized at the Catawba Nuclear Station Units 1 and 2, discussed by the Committee in its report of November 13, 1973. The scope of the FNP design includes the nuclear steam supply system (NSSS) and the balance of plant (BOP). The complete system, which is to be mounted on a large floating platform, represents a standard unit which is being designed for use at sites which fall within an envelope of parameters or specifications. The plant design includes specific requirements for major components, piping sytems, and other information necessary to ensure that both the NSSS and BOP are designed to protect the system from site-related hazards. Application of the FNP concept will require an evaluation of each site to confirm its acceptability within the given envelope.

Primary emphasis in this latest review of the FNP application was directed to an evaluation of progress being made on the resolution of issues raised by the Committee in its interim report of December 10, 1975. The review indicated that a number of the issues have been resolved. Those remaining are addressed below.

Evaluation of the adequacy of the emergency core cooling system (ECCS) design is an outstanding issue. This matter should be reviewed by the NRC Staff and the ACRS prior to issuance of a license to manufacture the FNP units.

A question which still exists relates to the consequences of an accident which could result in the release of radioactive materials into the water. The Committee wishes to withhold final judgment on the acceptability of the FNP application until the results on this question have been completed and have been evaluated.

In its most recent review, the Committee also gave further consideration to acceptable probabilities for each of several events, such as explosions in nearby ships, which could threaten the safety of the FNP. To assure that the sum of the probabilities of all such events will be acceptable, the Committee recommends that the specifications for this parameter within the proposed site envelope be suitably clarified by the NRC Staff.

The interim report issued by the Committee on December 10, 1975, listed a number of items on which it wished to be kept informed. The Committee recommends that the following items mentioned in that report be given additional attention. Resolution should be accomplished during the final design stages prior to completion of the construction of the first FNP unit. Issuance of a manufacturing license need not be contingent on the resolution of these items.

1. Independent analysis of containment shell buckling;

2. Turbine generator alignment and hull-coupled vibration;

3. Verification of structural behavior during towing operations;

4. Instruments to follow the course of an accident;

5. Fire protection design features;

6. Features to reduce the possibility and consequences of sabotage;

7. Possible increase in protection provided by an increase in containment design pressure;

8. Possible plant modifications to protect against extended loss of offsite power.

Generic problems relating to large water reactors are discussed in the Committee's report dated April 16, 1976. The Committee repeats its earlier recommendation that procedures be developed to incorporate approved resolution of these items into the FNP units.

The Advisory Committee on Reactor Safeguards believes that, subject to the resolution of the outstanding issues and subject to the other matters discussed above, the Floating Nuclear Plant units can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public.

Sincerely yours,

Dade W. Moeller

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Chairman

Additional Remarks by Messrs. M. Bender and S. H. Bush

The ACRS has always encouraged the examination of radionuclide dispersal into the environment for all types of accident circumstances, including a fully melted core that would penetrate containment. Such information is useful in understanding the ultimate seriousness of accidents and in determining the course of action that might be required should the totally unexpected ever occur. Nevertheless, a full-core melt that penetrates containment is not considered in the NRC's envelope of design-basis accidents. The frequency of occurrence of a core melt is expected to be well below that level at which substantial design changes are warranted. Additionally, we doubt that most design changes would ensure a substantive reduction in public health and safety risk attributable to such a nuclear accident.

It is our opinion that the FNP-ECCS, if properly engineered, will fully meet the requirements set forth in Appendix K of 10 CFR 50 and will adequately protect the plant against the possibility of a core melt. We do not believe, therefore, that the licensing of a Floating Nuclear Plant should hinge on the outcome of such studies.

We do believe the study of radionuclide pathways, resulting from a core melt, should be pursued and could properly include land-based as well as floating nuclear power stations. The results would be valuable in assessing the risk sensitivity of plant sites being considered for licensing and could be used as a site selection criterion when such marginal factors govern the benefit-cost basis for selecting siting alternatives.

References:

1. Floating Nuclear Plant (FNP) Plant Design Report (PDR) Volumes 1-8
2. Amendments 1-21 to the PDR
3. Supplement No. 1 to the Safety Evaluation Report by the Office of Nuclear Reactor Regulation (NRR), dated March 16, 1976
4. Letter, dated December 3, 1975, Offshore Power Systems (OPS) to NRR, concerning asymmetric loadings on reactor pressure vessel supports
5. Letter, dated December 17, 1975, OPS to NRR, concerning operating basis wind for U. S. Atlantic and Gulf coastal locations
6. Letter, dated December 18, 1975, OPS to NRR, concerning hazards from a coastal tanker accident
7. Letter, dated December 18, 1975, OPS to NRR, concerning containment shell buckling criteria
8. Letter, dated January 13, 1976, United States Coast Guard to NRR, concerning fire tests for external fire protection
9. Letter, dated January 16, 1976, OPS to NRR, concerning wind tunnel study of wind forces
10. Letter, dated January 23, 1976, OPS to NRR, concerning design for air blast loading
11. Letter, dated January 30, 1976, OPS to NRR, concerning hazards from a coastal tanker accident
12. Letter, dated March 4, 1976, OPS to NRR, concerning conformance to 10 CFR 50 Appendix I
13. Letter, dated February 27, 1976, OPS to NRR, concerning steam line break
14. Letter, dated February 16, 1976, OPS to NRR, concerning testing of the falling water film system
15. Letter, dated March 2, 1976, OPS to NRR, concerning containment shell buckling criteria
16. Letter, dated March 2, 1976, OPS to NRR, concerning platform hull drydocking equivalency