

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**  
**UNITED STATES ATOMIC ENERGY COMMISSION**  
**WASHINGTON, D.C. 20545**

December 10, 1974

Honorable Dixy Lee Ray  
Chairman  
U. S. Atomic Energy Commission  
Washington, D. C. 20545

Subject: REPORT ON SEABROOK STATION, UNITS 1 and 2

Dear Dr. Ray:

At its 176th Meeting, December 5-7, 1974, the Advisory Committee on Reactor Safeguards reviewed the application of the Public Service Company of New Hampshire, et al, for permits to construct Seabrook Station, Units 1 and 2. This project had been considered previously during a Subcommittee meeting in Hampton, New Hampshire, on August 21-22, 1974, subsequent to a tour of the site by members of the Committee on August 21, 1974; at the 173rd Meeting of the Committee, September 5-7, 1974; during a Subcommittee meeting in Washington, D. C., October 9, 1974; at the Special Meeting of the Committee, October 31- November 2, 1974; and during a Subcommittee meeting, December 4, 1974. During its review, the Committee had the benefit of discussions with the AEC Regulatory Staff and representatives and consultants of the applicant, the Westinghouse Electric Corporation, and United Engineers and Constructors, Inc. The Committee also had the benefit of the documents listed below and of comments and presentations from members of the public.

The site for the station is a 750-acre tract located near the town of Seabrook, New Hampshire. The site is approximately 12 miles south-southwest of Portsmouth, New Hampshire and 40 miles north-northeast of Boston, Massachusetts. Portsmouth is the nearest population center with 1970 population of about 26,000. Due to the beach areas of Seabrook and Hampton, New Hampshire, there is a large summertime increase in population within a few miles of the site.

The Seabrook Station will utilize two, four-loop pressurized water reactor nuclear steam supply systems each having a power level of 3411 MW(t) and a design similar to that of the Catawba Nuclear Station units previously reviewed by the Committee and reported upon in its letter of November 13, 1973.

The Regulatory Staff has determined that the ECCS performance evaluation for the Seabrook Station units meets the Interim Acceptance Criteria of June 1971. In addition, the applicant's ECCS performance evaluation, using an approved Westinghouse model, to show compliance with the Final Acceptance Criteria of 10 CFR 50.46 must be reviewed and approved by the Regulatory Staff.

The Committee recommended in its report of September 10, 1973, on acceptance criteria for ECCS, that significantly improved ECCS capability should be provided for reactors filing for construction permits after January 7, 1972. The Seabrook Station units are in this category. These units will use 17x17 fuel assemblies similar to those to be used in Catawba Units 1 and 2. Although calculated peak clad temperatures in the unlikely event of a LOCA are less for 17x17 assemblies than for a 15x15 array, the Committee believes that the applicant should continue studies responsive to the Committee's September 10, 1973 report. If studies establish that significant further ECCS improvements can be achieved, consideration should be given to incorporating them into this plant.

Although many details of the proposed 17x17 fuel design are available, complete analyses of the performance of this fuel arrangement are not yet available from the applicant, and the AEC Regulatory Staff has not completed its review. The Committee will review and address questions relating to the proposed 17x17 fuel design within the next few months in connection with operating license applications for other nuclear units employing similar fuel.

The applicant proposes a horizontal ground acceleration of 0.25g on bedrock at foundation as a seismic design basis for safe shutdown. Extensive consideration by the ACRS and its consultants of the site, of the foundation structure, and of the relationship of the site to the tectonic province in which it is located has led the Committee to conclude that the proposed acceleration is acceptable for this site.

Field and laboratory investigations by the applicant indicate that there are no known geologic features in the vicinity of the site that are likely to localize seismicity. Nevertheless, the Committee believes that all site excavations should be carefully mapped and any unusual features reviewed by geology and seismology experts of the applicant and the Regulatory Staff prior to being covered over or severely weathered.

One aspect of the engineered safety features in this plant which warrants further examination is the necessity of a cooling system for the charcoal adsorption beds in case of a major accidental release of airborne radioactive material within containment or the fuel storage building. To assist in resolving this issue, the Committee recommends that a parametric study be conducted to define an upper limit of the source term, to estimate quantitatively the resulting radionuclide loading on the beds, and to calculate the subsequent temperature increase as a function of time within adsorption beds of various configurations. If the heat load is not too large, such steps as increased air flow through the beds, cooling of the gas prior to entry into the bed, and rearrangement of the charcoal configuration within the beds may be adequate. The Committee wishes to be kept informed.

The Seabrook Station Units 1 and 2 will be the first commercial nuclear power plant in the State of New Hampshire. For this reason, the Committee recommends that the applicant and Regulatory Staff give particular attention to assuring proper coordination with appropriate state and regional agencies in the development of effective emergency plans for this facility. Because of the proximity of the Seabrook Station to the beaches on the coast and because of the nature of the road network serving the beaches, the applicant has given early attention to the problems of evacuation. The Committee believes, however, that further attention needs to be given to evacuation of residents and transients in the vicinity even though they may be outside the LPZ.

Several unresolved issues, such as appropriate capacity of the containment ventilation system and the containment enclosure transient pressure analysis following a postulated pipe break outside of containment, should be resolved in a manner satisfactory to the Regulatory Staff.

Generic problems relating to large water reactors have been identified by the Regulatory Staff and the ACRS and discussed in the Committee's report dated February 13, 1974. These problems should be dealt with appropriately by the Regulatory Staff and the applicant.

Honorable Dixy Lee Ray

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The Advisory Committee on Reactor Safeguards believes that the items mentioned above can be resolved during construction and that, if due consideration is given to the foregoing, the Seabrook Station Units 1 and 2 can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public.

Additional remarks by Dr. D. Okrent are attached.

Sincerely yours,

A handwritten signature in cursive script that reads "W. R. Stratton".

W. R. Stratton  
Chairman

References attached

Additional comments by D. Okrent

The Seabrook Station site is near what is generally recognized as the Cape Ann-to-Ottawa Trend. Mechanisms for earthquake generation in the New England area are not well understood, and expert opinion differs concerning the potential for and probability of relatively large earthquakes at or near the site.

The Regulatory Staff have ultimately based their judgment as to an acceptable safe shutdown earthquake on the application of 10 CFR Part 100, Appendix A, rather than a probabilistic estimate of earthquake size versus recurrence interval. It is of interest to note that Appendix A provides only general guidance; furthermore, it specifically refers to the possible choice of a safe shutdown earthquake larger than that found in the historical record for a tectonic structure or province.

During the ACRS review the Regulatory Staff did state that the seismicity of the tectonic region applicable to the Seabrook site could be interpreted to be about an order of magnitude larger than other tectonic provinces having a similar maximum historical seismic event. Furthermore, a member of the Regulatory Staff stated that his estimate of the probability per year of occurrence of an earthquake of intensity MM VIII at the Seabrook site is about  $10^{-4}$ , and the Staff did not rule out the possibility of a larger earthquake occurring within the region under consideration. They stated that conservatism in analysis, stress limits, and other factors decrease the overall probability of failure of seismic Class 1 structures and piping by a few orders of magnitude and hence, the overall probability of a seismically induced accident exceeding 10 CFR Part 100 would be acceptably low. However, earthquakes are almost unique in their ability to fail each and every structure, system, component, or instrument important or vital to safety, and, in my opinion, the Staff evaluation of additional margin available from stress limits, methods of analysis, etc., did not consider all such systems, e.g., D.C. power or emergency A.C. power.

It is clear that the capability of a reactor to achieve safe shutdown, assuming its SSE occurs, cannot be fully demonstrated by test. Those limited, detailed independent audits of seismic design of actual plants that have been published indicate that some inadequacies in design and construction exist. Equally or more important, it appears to be unlikely that the plant could survive safely, with a high degree of assurance, a larger earthquake having one or two orders of magnitude lower probability than the proposed SSE.

Additional comments by D. Okrent (continued)

Given this background, and recognizing the substantial surrounding year-round population density and the very high nearby population during the summer months at Seabrook, I am left uneasy and believe it would be prudent to augment the proposed SSE acceleration of 0.25g.

I also wish to reiterate my conclusion previously stated in connection with the review of Grand Gulf Units 1 and 2, namely that it would be prudent to provide some additional margin in the seismic design bases for most future nuclear plants sited east of the Rockies.

References:

1. Public Service Company of New Hampshire Application for a Construction Permit for the Seabrook Station with Preliminary Safety Analysis Report (PSAR), Volumes 1 through 7.
2. Amendments 1-13, 15-19, and 21-26 to the PSAR.
3. Directorate of Licensing's Safety Evaluation of the Seabrook Station, Units 1 and 2, dated August 14, 1974; Supplement 1, dated August 20, 1974; and Supplement 2, dated October 8, 1974.
4. Directorate of Licensing's Summaries of Outstanding Safety-Related Issues for the Seabrook Station, Units 1 and 2, dated August 16, 1974; October 9, 1974; and October 31, 1974, respectively.
5. Public Service Company of New Hampshire letters:
  - a. October 23, 1973, concerning transient beach population.
  - b. December 21, 1973, concerning waste processing system.
  - c. December 26, 1973, concerning geology-regional fault investigations.
  - d. October 1, 1974, concerning anticipated transients without scram and reactor protection system.
6. New England Coalition on Nuclear Pollution letters:
  - a. August 15, 1974, concerning seismic issues and population density and evacuation.
  - b. October 25, 1974, concerning site characteristics, geology and seismology.
  - c. December 2, 1974, concerning seismology.
  - d. December 5, 1974, concerning seismology.
7. Elizabeth H. Weinhold letters:
  - a. August 13, 1974, concerning seismology, geology, and evacuation.
  - b. Undated (received October 3, 1974) concerning safe shutdown earthquake design value.
  - c. October 21, 1974, concerning earthquake intensities.