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

June 12, 1973

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

Subject: INTERIM REPORT ON CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2

Dear Dr. Ray:

During its 158th meeting, June 7-9, 1973, the Advisory Committee on Reactor Safeguards conducted a review of the application of the Baltimore Gas and Electric Company for authorization to operate the Calvert Cliffs Nuclear Power Plant, Units 1 and 2 at power levels up to 2560 MW(t) each. The project was considered previously at Subcommittee meetings at the site on August 22, 1972, and in Washington, D. C. on September 7, 1972, and May 23, 1973. During the review the Committee had the benefit of discussion with representatives of Baltimore Gas and Electric Company, Combustion Engineering, Incorporated, Bechtel Corporation, the AEC Regulatory Staff, and their consultants. The Committee also had the benefit of the documents listed. The Committee reported to the Commission on the construction of these units in its report of March 13, 1969.

The Calvert Cliffs Nuclear Power Plant is located in a sparsely populated area on the western shore of Chesapeake Bay, about 11 miles southeast of Prince Frederick, Maryland and 45 miles southeast of Washington, D. C.

Each unit of the plant employs a Combustion Engineering pressurized water reactor with core design similar to that of the Maine Yankee plant and reactor cooling system and emergency core cooling systems similar to those for the Palisades plant. The design of the containment buildings is similar to that of the Turkey Point and Oconee stations.

Subsequent to tensioning of the vertical tendons on the Unit 1 containment structure, a number of the upper tendon bearing plates were noted to have receded slightly in the concrete. Investigation eventually revealed that voids of various magnitudes existed under 188 of the 204 upper bearing plates of Unit 1 and under 178 of those of Unit 2. An extensive repair and grouting program has been undertaken to effect filling of the voids. At this time, grouting under all 188 plates of Unit 1 has been completed and inspected, as well as for a portion of the plates of Unit 2. Further inspection of the plates is planned, including measurement of any deflection that might occur, upon conclusion of containment strength testing and at six month intervals thereafter over a two year period. Contingent upon satisfactory completion of the grouting work and containment strength testing, this void evaluation and repair program is considered acceptable.

An evaluation of required protection against postulated ruptures of high energy piping outside containment has been conducted by the applicant in accordance with criteria established by the Regulatory Staff. Extensive design changes have been found necessary, including incorporation of encapsulation sleeves, pipe whip restraints, space venting, equipment relocation, and jet impingement protection. The applicant expects the related plant modifications to be completed by April, 1974. The Regulatory Staff intends not to authorize operation at power levels above about five percent of full power until after completion of the modifications. The Committee considers these provisions to be satisfactory.

The reactor vibration test program proposed by the applicant is acceptable to the Regulatory Staff, provided that the vibration test results recently obtained from the Maine Yankee reactor and those to be obtained from the Fort Calhoun reactor are shown to substantiate adequately the analytical techniques employed for predicting response of the Calvert Cliffs units. If this substantiation is not adequate, a complete preoperational test program similar to that at Maine Yankee will be required. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

The applicant has provided means for coping with hydrogen which might be generated in the unlikely event of a loss-of-coolant accident. Two electric recombiners, in addition to a backup purge system, have been installed. A prototype of the recombiner has been tested satisfactorily in a simulated post-LOCA environment. The purge system

is arranged to exhaust through the charcoal filters of the containment penetration room ventilation system. The Committee believes these hydrogen control provisions to be satisfactory.

The Committee reiterates its previous comments on the need to study further means of preventing common mode failures from negating reactor scram action, and design features to make tolerable the consequences of failure to scram during anticipated transients. The Committee believes it desirable to expedite these studies and to implement in timely manner such design modifications as are found to improve significantly the safety of the plant in this regard. The Committee wishes to be kept informed of the resolution of this matter.

Significant fuel densification effects have developed in some plants employing unpressurized fuel. The Calvert Cliffs Units 1 and 2 will utilize pre-pressurized fuel, and there is reason to expect less degradation of fuel performance; nevertheless, some effects on performance are anticipated. The applicant has made analyses taking into account these densification effects and has proposed certain limits on linear heat generation rates and core peaking factors, as well as procedures for surveillance of core power distribution and fuel condition, which he believes will enable operation at full power with adequate margins of safety. These analyses, however, have employed models not all of which have been accepted by the Regulatory Staff (in particular, the model for treatment of gap conductance). Consequently, the Staff has not at this time completed its evaluation in respect to permissible operating power level and associated core operating conditions for the Calvert Cliffs units. New proposed limits based on analyses made with approved models will be submitted by the applicant in the future.

The Committee believes that the matters mentioned above can be resolved satisfactorily on a suitable time scale.

Other problems relating to large water reactors which have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports should be dealt with appropriately by the Regulatory Staff and the applicant as suitable approaches are developed. In particular, the Committee recommends that as the results of additional research, analyses, and design studies become available, they should be used by the applicant for evaluation and possible improvement of the emergency core cooling systems.

The Committee will report to you further regarding the acceptable power level for this plant after a recommendation has been made by the Regulatory Staff and the appropriate Supplement to the Safety Evaluation has been reviewed by the Committee.

Sincerely yours,

Original Signed by
H. G. Mangelsdorf

H. G. Mangelsdorf
Chairman

Attachment:

List of References

References

1. Baltimore Gas and Electric Company (BG&E) Final Safety Analysis Report for Calvert Cliffs Nuclear Power Plant, Vols. I through V

2. Amendments 12 through 37 to BG&E License Application for Calvert Cliffs Nuclear Power Plant

3. BG&E Security Plan for Calvert Cliffs (Proprietary), 5/2/72, with two revisions, 8/3/72 and 9/25/72

4. Directorate of Licensing Safety Evaluation, 8/28/72 with Supplement 1, 5/3/73