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

December 12, 1974

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

Subject: REPORT ON PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2

Dear Dr. Ray:

At its 176th meeting, on December 5-7, 1974, the Advisory Committee on Reactor Safeguards completed its review of the application of the Cleveland Electric Illuminating Company, the Duquesne Light Company, the Ohio Edison Company, the Pennsylvania Power Company, and the Toledo Edison Company (the applicants), for a permit to construct the Perry Nuclear Power Plant, Units 1 and 2. The Committee also considered this application during its 172nd meeting on August 8-10, 1974. The site for the proposed plant was visited by Committee members on June 28, 1974. Subcommittee meetings were held on this project in Painesville, Ohio, on June 28, 1974, and in Washington, D. C., on July 23 and November 23, 1974. In its review, the Committee had the benefit of discussions with representatives of the applicants, their consultants and contractors, and representatives of the Regulatory Staff and of the documents listed.

The Perry Nuclear Power Plant will be located on the southern shore of Lake Erie in Lake County, Ohio, approximately 35 miles northeast of Cleveland and seven miles northeast of Painesville, Ohio, which has been identified as the nearest population center since its population is expected to exceed 25,000 by 1980.

The Perry Nuclear Power Plant consists of two nuclear units, each using a General Electric BWR/6 nuclear steam supply system having a design power level of 3579 MW(t) and containing 732 fuel assemblies in a pressure vessel with an internal diameter of 238 inches. The Committee reported on the BWR/6 system on September 21, 1972. Each unit will be provided with a Mark III containment system which includes a free-standing steel shell as the primary containment structure; the Committee reported on the Mark III containment concept in a letter dated January 17, 1973, and again in its report on the Grand Gulf Nuclear Station, Units 1 and 2, dated May 15, 1974.

The General Electric Company is conducting an analytical and experimental program intended to provide more detailed knowledge of the behavior of the Mark III containment system. Among the phenomena for which further information is needed are vent-clearing, vent interaction, pool swell, pool stratification, and dynamic and asymmetric loads on suppression pool and other containment structures. This program is of importance to the completion of the validation of the Mark III concept. The Committee emphasizes the importance of directing the test and analytical programs toward providing not only empirical design correlations but also toward more detailed evaluations of the relevant two-phase phenomena in order to enable the better application of a specific set of scaled tests to a range of actual reactor conditions. Further, the Committee recommends that the independent models developed by the Regulatory Staff and their consultants be used to evaluate the sensitivity of key design parameters, including additional effects noted in the experimental programs, such as oscillatory phenomena. The Committee urges that the R&D program be expedited so that all design-related issues are fully resolved prior to completion of construction of affected portions of the plant. Should any results indicate a significant deviation from current predictions of the designer, the Committee wishes to be informed promptly.

The applicants have proposed, and the Regulatory Staff has accepted, a combustible gas control system designed on the basis of an assumed one percent metal-water reaction. The system contains hydrogen recombiners and a controlled purging system for the drywell. The Committee notes that appropriate attention should be given to gas mixing in the drywell.

A Regulatory Staff requirement, which has become a generic issue, pertains to designing the radioactive offgas system, including the adsorption beds, to Seismic Category I to meet item C.1.p. of Regulatory Guide 1.29. This Guide requires that the offgas system meet the seismic requirement if potential offsite doses exceed 0.5 rem. The Committee recognizes that the offsite dose will be a function of the total source term, the assumptions relating to the rate of release of the source, and the assumed meteorology. The Committee believes that appropriate conservatisms should be used in determining the dose in the unlikely event of a seismically induced failure of the offgas system. However, the Committee questions the validity of multiplicative conservatisms when the source of radioactivity is relatively limited. The Committee recognizes that the application of Regulatory Guide 1.29 has major design implications to several auxiliary systems in addition to the offgas system. The Committee urges that the applicants and the Regulatory Staff arrange to have additional research conducted to better define quantitatively the key factors necessary for evaluating this type of accident situation. The Committee also requests that the Regulatory Staff review the

conservatisms in the source term and in the meteorological model to establish whether all of the required conservatisms are appropriate. The Committee wishes to be kept informed.

In the view of the Regulatory Staff, the proposed design of the residual heat removal system has not been demonstrated to be capable of functioning assuming the most restrictive single failure as required by General Design Criterion 34. The Committee believes that an adequate system analysis of this generic problem has not been made which takes into account the complete system and all modes of behavior. The Committee recommends that additional study be made. The Committee wishes to be kept informed.

The Regulatory Staff has determined that the ECCS performance evaluation of the Perry units meets the Interim Acceptance Criteria of June, 1971. In addition, the applicants' ECCS performance evaluation, using an approved General Electric model to show compliance with the Final Acceptance Criteria of 10 CFR 50.46, must be submitted and then reviewed and approved by the Regulatory Staff. The Committee wishes to be kept informed.

A recent publication (See Reference 11) suggests a need for the use of three-dimensional calculations to correctly predict peak flux and temperature distributions for super-prompt-critical excursions. This may be relevant to analysis of the rod-drop accident, and both General Electric and the Regulatory Staff have initiated work to clarify the situation. This matter should be resolved in a manner satisfactory to the Regulatory Staff. The Committee wishes to be kept informed.

The applicants propose to use two hyperbolic, natural draft cooling towers in a closed cycle cooling system for the normal mode of thermal energy rejection. Lake Erie will be utilized as the Ultimate Heat Sink. The applicants are reviewing possible localized meteorological effects of the natural draft cooling towers on structural loads in the safety-related structures and on onsite meteorological measurements. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

The applicants are arranging to control the mineral rights within 1800 feet, and the underground storage rights for propane within two miles, of all safety-related structures, systems, and components. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

The Regulatory Staff is continuing to review several items that apply to the Perry Nuclear Power Plant which are also generic to BWR/6 reactors and to Mark III containment systems. The Committee wishes to be kept advised of the resolution of these matters.

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

The ACRS believes that the above items can be resolved during construction and that, if due consideration is given to these items, the Perry Nuclear Power Plant, Units 1 and 2, can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public.

Sincerely yours,

W. R. Stratton

W. R. Stratton
Chairman

PERRY PLANT REFERENCES

1. The Cleveland Electric Illuminating Company (CEI) Preliminary Safety Analysis Report (PSAR), dated June 22, 1974, Volumes 1-10, for the Perry Nuclear Power Plant, Units 1 and 2.

2. Amendments 1-6, 8-13, and 15-21 to PSAR including Volumes 11 and 12.

3. CEI letter dated March 1, 1974, concerning new design items.

4. CEI letter dated April 6, 1974, concerning additional commitments and clarifications.

5. CEI letter dated August 12, 1974, concerning 8X8 fuel assembly spray cooling test and qualifications of personnel involved in quality assurance and control.

6. CEI letter dated September 20, 1974, concerning commitments involving salt rights.

7. CEI letter dated November 7, 1974, concerning clarification of information submitted with Amendment 21 to PSAR.

8. CEI letter dated November 11, 1974, concerning effect of cooling towers on wind velocities.

9. Directorate of Licensing letter dated July 22, 1974 transmitting "Summary Statement of Outstanding Safety-Related Issues" and "Safety Evaluation Report" issued July 1974.

10. Directorate of Licensing letter dated December 4, 1974 transmitting "Summary Statement of Outstanding Safety-Related Issues" and "Supplement No. 1 to the Safety Evaluation Report".

11. "Comparison of Two-and-Three Dimensional Calculations of Super Prompt Critical Excursions" by A. Birkhofer, A. Schmidt, and W. Werner, Nuclear Technology, Volume 24, pp 7-12, October 1974.