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

November 20, 1974

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

Subject: REPORT ON TROJAN NUCLEAR PLANT

Dear Dr. Ray:

At its 175th meeting, November 14-16, 1974, the Advisory Committee on Reactor Safeguards completed its review of the application of the Portland General Electric Company, the City of Eugene, Oregon, acting by and through the Eugene Water and Electric Board, and the Pacific Power and Light Company for authorization to operate the Trojan Nuclear Plant. The project has been previously considered at a Subcommittee meeting on October 17, 1974, and a tour of the facility was made by Subcommittee members on October 18, 1974. The new Westinghouse 17x17 fuel rod assembly to be employed in the Trojan reactor was also reviewed by the Committee at the 175th meeting; it was previously considered at a Subcommittee meeting on July 30, 1974. In the review of the Trojan plant and of the 17x17 fuel assembly, the Committee had the benefit of discussions with representatives and consultants of the Applicant, the Bechtel Corporation, the Westinghouse Electric Corporation, and the AEC Regulatory Staff. The Committee also had the benefit of the documents listed.

The plant will be located on a 635-acre site on the west bank of the Columbia River approximately 40 miles north of Portland, Oregon. The nearest population center is the Kelso and Longview, Washington area, six miles from the site, with a 1970 population of about 39,000.

At the time of the construction permit review, design for tornado loadings was not required for plants located west of the Rocky Mountains because of the very low probability of tornadoes in this region. Subsequent to that time, the design of those portions of the plant critical to safety was reviewed and changes were made as needed to provide resistance to tornado loadings corresponding to wind velocities of at least 200 miles per hour. The Committee believes that the plant as constructed is in reasonable conformance with the tornado criteria now incorporated in Regulatory Guide 1.76, and that a satisfactory level of safety has been achieved.

The Trojan Nuclear Plant will include a four-loop Westinghouse nuclear steam supply system with a design core power level of 3411 MWt. The reactor will be one of the first to operate with fuel assemblies having a 17x17 rod array.

At the construction permit stage, the Trojan plant design included redundant spray systems for the removal of heat from the containment following a postulated loss-of-coolant accident. As suggested by the Committee in its letter of July 17, 1970, the design has been changed to include both spray and fan-cooler systems and thus provides diversity as well as redundancy.

The Regulatory Staff has proposed that the power be disconnected from certain motor-operated valves in the ECCS in order to prevent a single failure in the electrical system from disabling a part of an essential safety system. The Applicant has argued that a spurious signal is highly improbable and that locking out power to these valves will not necessarily lead to greater safety. The Committee believes that a complete systems analysis of this generic problem has not been made which takes into account all possible failures, both electrical and mechanical, for these valves in both the locked-out and normal configurations, and recommends that additional studies be made of possible alternatives. This matter should be resolved in a manner satisfactory to the Regulatory Staff. The Committee wishes to be kept informed.

The Committee believes that the Trojan plant should be provided with a system capable of prompt detection of gross failure of a fuel element. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

Several changes are to be made in the Westinghouse ECCS evaluation model to bring it into conformance with the Commission Criteria as given in 10 CFR 50.46. The performance of the emergency core cooling systems will be re-evaluated with the approved evaluation model, and appropriate operating limits and procedures for ensuring monitoring of the power distribution are to be incorporated in the Technical Specifications. The Committee wishes to be kept informed.

The evaluation of Anticipated Transients Without Scram (ATWS) has been made generically for Westinghouse plants, and the Applicant has made comparisons indicating that the results obtained are applicable to the Trojan plant. Regulatory review should be completed and this matter resolved in a manner satisfactory to the Regulatory Staff. The Committee wishes to be kept informed.

The Westinghouse 17x17 fuel rod array is identical to that to be used in Catawba Units 1 and 2 and in several other nuclear power stations which have recently been reviewed for construction by the Committee. The Trojan plant is scheduled to be one of the first to go into operation using a full core of 17x17 fuel. While many of the various required verification programs have been completed and reviewed by the Regulatory Staff, other tests and analyses are still to be completed and documented. These include: DNB tests with non-uniform heat flux, single-rod burst tests, fuel assembly flow tests, guide tube tests, and the effect of bowing on DNB. The results of such tests and analyses should be evaluated fully by the Regulatory Staff and resolved to their satisfaction prior to the full core use of 17x17 fuel to produce power. Four prototype 17x17 fuel rod assemblies are to be loaded into other operating pressurized water reactors in the near future; the results of these irradiations should be followed closely. The Committee wishes to be kept informed concerning the results of the various ongoing 17x17 test and analytical programs and any design changes which may be proposed in the future.

The Applicant has proposed a fuel surveillance program to follow the behavior of the fuel as its irradiation progresses. Following each cycle of operation, 17x17 fuel assemblies will be examined for fuel rod integrity, fuel rod and assembly dimension and alignment, and surface deposits. In addition, one fuel assembly will contain fuel rods which can be removed to facilitate interim and end-of-life fuel rod evaluation as a function of exposure. In view of the fact that the 17x17 fuel array is a new design and that no prototype irradiations are planned for 17x17 fuel containing eight spacer-grids (which will be employed only in full - core operation), the results of this surveillance program should be followed closely. The Committee wishes to be kept informed.

The recently proposed method of constant axial offset control will be used for in-core power distribution monitoring and control. The Regulatory Staff should review carefully the effectiveness of this method of control in protecting against adverse consequences of postulated reactor transients and accidents. The Committee wishes to be kept informed.

The Trojan reactor may be the first reactor of its type to operate with a rated power as high as 3411 MWt. Because there is limited operating experience with very large, high power density reactors, the ACRS believes that a more cautious than normal approach to full power is prudent, with longer periods of operation at power levels in the range of 70 to 90% of full power, and with additional monitoring of core and systems performance throughout the life of the first core. The Committee recommends that the Regulatory Staff evaluate the overall operating experience prior to sustained operation at full power.

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 as suitable approaches are developed.

The Advisory Committee on Reactor Safeguards believes that, if due regard is given to the items mentioned above, and subject to satisfactory completion of construction and preoperational testing, there is reasonable assurance that the Trojan Nuclear Plant can be operated at power levels up to 3411 MWt without undue risk to the health and safety of the public.

Sincerely yours,

W. R. Stratton

W. R. Stratton
Chairman

References

1. Final Safety Analysis Report for the Trojan Nuclear Plant, Volumes 1-9 (including Amendments Nos. 1-17)
2. "Safety Evaluation Report, Trojan Nuclear Plant," U.S.A.E.C. Directorate of Licensing, dated October 7, 1974
3. "Trojan Nuclear Plant Safety-Related Schematic Diagrams," PGE-1001, Volumes 1-2. (including Amendments Nos. 1-4)
4. "Trojan Nuclear Plant Safety-Related Schematic Diagrams," PGE-1002, dated March, 1973 (PROPRIETARY)
5. "Trojan Nuclear Site - Results of Laboratory Rock Testing," Bechtel Engineering Corporation (undated)
6. "Geophysical Survey of Trojan Nuclear Power Plant Site, Longview, Washington" PC Exploration (undated)
7. "Trojan Nuclear Plant Analysis of Pipe System Breaks Outside Containment," PGE-1004 (including Revision #1, dated January, 1974)
8. Letter, Portland General Electric Company (PGE) to U. S. AEC Directorate of Licensing (DL), dated June 17m 1974, concerning preoperational testing of emergency core cooling systems
9. "Radiological Emergency Response Plan Trojan Nuclear Plant," Revision A PGE-1008, dated April, 1974