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

August 18, 1976

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

Subject: REPORT ON SWESSAR-P1, STONE AND WEBSTER ENGINEERING CORPORATION BALANCE-OF-PLANT DESIGN AS APPLIED TO THE WESTINGHOUSE ELECTRIC CORPORATION RESAR-3S NSSS DESIGN

Dear Mr. Rowden:

At its 196th meeting, on August 12-14, 1976, the Advisory Committee on Reactor Safeguards reviewed the application of the Stone and Webster Engineering Corporation for a Preliminary Design Approval of its SWESSAR-P1, a standardized nuclear balance-of-plant (BOP) design that would interface with a single unit Westinghouse Electric Corporation RESAR-3S pressurized water nuclear steam supply system (NSSS). The SWESSAR-P1 BOP design was first reviewed by the Committee in relation to the Westinghouse RESAR-41 NSSS, and a report provided on February 11, 1976. The description of SWESSAR-P1 provided in the February 11, 1976 report is applicable to RESAR-3S; the latter was reviewed and a report provided by the Committee on July 14, 1976. During its review, the Committee had the benefit of discussions with representatives of the Stone and Webster Engineering Corporation and the Nuclear Regulatory Commission (NRC) Staff. The Committee also had the benefit of the documents listed.

The arrangement of SWESSAR-P1 provides extensive physical separation of critical safety-related equipment to protect against common mode failures associated with fires or other operational contingencies. However, complete design details for SWESSAR-P1 have not been developed and the concept has not yet been applied to a complete nuclear power plant design. Consequently, further review of the physical separation arrangement should be made prior to the Final Design Approval or when SWESSAR-P1 is proposed for a nuclear power plant for which a construction permit is being sought. The Committee wishes to be kept informed.

A matter of major concern in the NRC Staff's review has been the safety-related interfaces between the SWESSAR-P1 BOP design and the RESAR-3S NSSS design, on one hand, and the custom-designed site-related structures and components, on the other hand. The responsibilities and requirements related to the SWESSAR-P1/RESAR-3S interfaces have been partially defined in the Safety Analysis Reports for these two standardized designs. The Committee believes that these interface requirements are satisfactory for a Preliminary Design Approval, but expects the NRC Staff and the utility applicant to continue to examine them further in connection with the proposal to use these designs for a specific plant when it is reviewed for a construction permit. The interfaces between SWESSAR-P1 and the site-related features are defined in the SWESSAR-P1 Safety Analysis Report, but have not yet been subjected to the test of a complete design for a nuclear power plant. The NRC Staff should review these interfaces in greater depth when a construction permit application is received.

The Committee recommends that, during the design, procurement, construction, and startup, timely and appropriate interdisciplinary system analyses be performed to assure complete functional compatibility across each interface for the entire spectrum of anticipated operations and postulated design basis accident conditions.

The coordination of interdependent instrumentation and controls in the nuclear island and in the balance of plant will require attention at the time when SWESSAR-P1 is used as a portion of a nuclear power plant license application. These matters should be included in the NRC Staff's Standard Review Plan.

The proposed orientation of the turbine-generator with respect to the nuclear island is suitable for a single unit installation. For multiple unit power plants, the location and orientation of the units should be such as to yield acceptably low probabilities of damage by low-trajectory turbine-generator missiles, or suitable missile shielding should be provided.

The SWESSAR-P1 and the RESAR-3S NSSS designs, as do many others, utilize the concept of two-track continuous duty systems such as ventilation and service water which perform critical service functions. In some cases the probability of failure of one of these systems is not low. The failure of the second system to start or continue to operate may cause progressively damaging consequences. The Committee recommends that failures of this kind be evaluated to determine if the necessary reliability exists for these systems and whether remedial measures are appropriate.

Although SWESSAR-P1 and RESAR-3S include provisions for protection against industrial sabotage, the Committee believes that further steps can be taken beyond those provided. Prior to the use of SWESSAR-P1/RESAR-3S as a portion of an application for a nuclear power plant license, the utility applicant should be required to demonstrate that acceptable industrial sabotage provisions will be incorporated into the plant design.

The SWESSAR-P1 design includes some provisions which anticipate the maintenance, inspection, and operational needs of the plant throughout its service life, including cleaning and decontamination of the primary coolant system, and eventual decommissioning. However, when SWESSAR-P1 is used as a portion of a nuclear power plant license application the Committee believes that the NRC Staff and the utility applicant should further review methods and procedures for removing accumulated radioactive contamination whereby maintenance and inspection programs and ultimate decommissioning can be more effectively and safely performed.

Generic problems related to large water reactors are discussed in the Committee's report dated April 16, 1976. Those problems relevant to SWESSAR-P1 and RESAR-3S should be dealt with appropriately by the NRC Staff and the utility applicant as solutions are found. The relevant items are: Group II - Items 1, 2, 3, 4, 5, 6, 7, 9, 10, 11; Group IIA - Items 1, 4, 5, 6, 7, 8; Group IIB - Item 2; Group IIC - Items 1, 2, 3, 4, 5, 6, 7.

The Advisory Committee on Reactor Safeguards believes that the items mentioned above can be resolved during the standardized plant licensing process and that, if due consideration is given to the foregoing and to the recommendations in the Committee's report of July 14, 1976 on RESAR-3S, Preliminary Design Approval for SWESSAR-P1 to be used in conjunction with RESAR-3S can be granted in accord with the spirit and purposes set forth in the Commission's policy statement on standardization of nuclear power plants as described in WASH-1341, "Programmatic Information for the Licensing of Standardized Nuclear Power Plants" and in conformance with the Regulations of Appendix O to Part 50 and Section 2.110 of Part 2 of Title 10 of the Code of Federal Regulations.

Sincerely yours,

Dade W. Moeller

Dade W. Moeller
Chairman

References

1. Pressurized Water Reactor Reference Nuclear Power Plant Safety Analysis Report (SWESSAR-Pl) and Amendments 1 through 27.

2. Stone and Webster Engineering Corporation letters:
   a. February 18, 1976 - Design Load Rejection Capability
   b. April 13, 1976 - Withdrawal of Design Load Rejection Proposal

3. Report to the Advisory Committee on Reactor Safeguards in the Matter of Stone and Webster Engineering Corporation Standard Safety Analysis Report PWR Reference Nuclear Power Plant SWESSAR-Pl (and its relationship to the RESAR-3S Standard NSSS Design) Docket No. STN 50-495, Published: June 1976, U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation.

4. Stone and Webster Engineering Corporation letter dated March 3, 1976, transmitting additional information concerning SWESSAR/RESAR-3S Design.