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

January 13, 1978

Honorable Joseph M. Hendrie
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 BABCOCK-205 STANDARD NUCLEAR STEAM SYSTEM

During its 213th meeting, January 5-7, 1978, 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 Babcock & Wilcox Company Babcock-205 pressurized water nuclear steam system. The SWESSAR-P1 BOP design has previously been reviewed by the Committee in relation to the Westinghouse RESAR-41 and RESAR-3S and the Combustion Engineering CESSAR-80 nuclear steam supply system designs. Reports on these reviews are dated February 11, August 18, and June 11, 1976, respectively. The Committee's report on the Babcock & Wilcox Company Babcock-205 standard nuclear steam system design is dated August 18, 1977. During its review, the Committee had the benefit of discussions with representatives of the Stone and Webster Engineering Corporation and the Nuclear Regulatory Commission 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, the concept has not yet been applied to a complete nuclear power plant design. Consequently, further review of the physical separation arrangements should be made prior to the Final Design Approval or when SWESSAR-P1 is reviewed in connection with a nuclear power plant for which a construction permit is being sought.

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 Babcock-205 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/Babcock-205 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 will examine them further in connection with a 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 (Generic Item IID-1 in ACRS Report, "Status of Generic Items Relating to Light-Water Reactors: Report No. 6," dated November 15, 1977).

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 (Generic Item II-1 in ACRS Report, "Status of Generic Items Relating to Light-Water Reactors: Report No. 6," dated November 15, 1977).

The SWESSAR-P1 and the Babcock-205 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 or whether remedial measures are required.

Although SWESSAR-P1 and Babcock-205 include provisions for incorporation of features which will provide physical protection of the plant, the utility applicant using this design should be required to demonstrate that acceptable features will be incorporated into the plant (Generic Item IIC-2 in ACRS Report, "Status of Generic Items Relating to Light-Water Reactors: Report No. 6," dated November 15, 1977).

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-Pl 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 Items IIC-3A & B in ACRS Report,"Status of Generic Items Relating to Light-Water Reactors: Report No. 6," dated November 15, 1977).

The Committee believes that the items mentioned above can be resolved prior to the issuance of a construction permit referencing SWESSAR-Pl/ Babcock-205.

The NRC Staff has identified certain safety items that will require resolution prior to issuance of a Preliminary Design Approval. These matters should be resolved in a manner satisfactory to the NRC Staff.

With regard to the generic items cited in the Committee's report, "Status of Generic Items Relating to Light-Water Reactors: Report No. 6," dated November 15, 1977, those items considered relevant to SWESSAR-Pl are: II-2, 6, 9; IIA-4; IIC-1, 4, 5, 6; IID-2; IIE-1. In addition, attention is called to those items relevant to the Babcock-205 Standard Nuclear Steam System as cited in the Committee's report of August 18, 1977.

The Advisory Committee on Reactor Safeguards believes that, if due consideration is given to the foregoing and to the recommendations in the Committee's report of August 18, 1977 on Babcock-205, Preliminary Design Approval for SWESSAR-Pl to be used in conjunction with Babcock-205 can be granted.

Sincerely yours,

Stephen Lawroski

Stephen Lawroski
Chairman

References

1. Pressurized Water Reactor Reference Nuclear Power Plant Safety Analysis Report (SWESSAR-Pl) and Amendments 1 through 36.
2. Report to the Advisory Committee on Reactor Safeguards by the U.S. Nuclear Regulatory Commission in the Matter of Stone and Webster Engineering Corporation Pressurized Water Reactor Reference Nuclear Power Plant Safety Analysis Report as Related to BSAR-205, Docket No. STN 50-495, dated November 1977.
3. Stone and Webster Engineering Corporation letter from W.J.L. Kennedy to J.F. Stolz, NRC, dated June 8, 1977, regarding numerical and analytical solutions for structural response to missile impact.