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

September 21, 1972

Honorable James R. Schlesinger
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: BOILING WATER REACTOR DESIGN, BWR/6

Dear Dr. Schlesinger:

At its 148th meeting, on August 10-12, 1972, the Advisory Committee on Reactor Safeguards completed its review of the design concept and expected performance of the new General Electric Company BWR/6 boiling water reactor product line. This concept was discussed at the 143rd ACRS meeting on March 2-4, 1972, and at Subcommittee meetings held in Washington, D. C., on March 21 and July 20, 1972. During its review, the Committee had the benefit of discussions with representatives of the General Electric Company and the AEC Regulatory Staff, and of the documents listed below.

The BWR/6 concept provides a 20 percent increase in thermal output over the previous product line of boiling water reactors with the same reactor vessel sizes. At the same time, changes in design provide reduction in the linear heat generation rates from 18.5 to 13.4 kw/ft, for the maximum, and from 7.1 to 6.0 kw/ft, for the average. The BWR/6 concept uses the same emergency core cooling systems as those in the previous designs.

Jet pumps have been made more compact, permitting an increase in the core size to accommodate a 10 percent increase in the number of fuel assemblies. Furthermore, the jet pumps have been improved to provide a 10 percent increase in flow. The overall fuel assembly size has been retained, but the fuel rods have been reduced in diameter and an 8x8 fuel assembly is used instead of the previous 7x7. The power density is to be increased 10 percent, from 51 to 56 kw/liter. The active fuel length has been increased from 144 to 148 inches.

Significant decreases in the local peaking factor are to be achieved through changes in the control rod blade thickness and fuel assembly channel wall thickness, leading to reduced and symmetric water gaps.

Further improvement is to be achieved through the use of one or more central water rods. The use of axially distributed gadolinia leads to a reduction in the axial peaking factor.

With these changes, the peak clad temperatures calculated by the applicant for the design basis loss-of-coolant accident (LOCA) are appreciably lower than those for previous designs. The lower peak clad temperatures and the increased thickness of the Zircaloy cladding provided in the BWR/6 concept combine to suggest that there would be few perforations in the event of a LOCA. Detailed evaluation of the stated ECCS performance remains to be accomplished.

Programs to demonstrate and evaluate equipment performance are in progress, including tests of control rods and jet pumps. Other tests to be completed are critical heat flux measurements and core spray and flooding heat transfer studies. Additional documentation for the nuclear, hydraulic, and mechanical design of the new configuration will be required to more thoroughly establish the appropriate safety margins and to provide adequate justification of the suitability of the proposed design. Design aspects related to possible reactivity transients also remain to be evaluated.

The Committee reiterates its previous comments concerning the need to study further means of preventing common mode failures from negating scram action and the design features to make tolerable the consequences of failure to scram during anticipated transients. Also resolution should be expedited of other problems relating to large water reactors, which have been identified by the Regulatory Staff and the ACRS and cited in previous reports.

The Committee believes that, subject to the above comments and to successful completion of the remaining confirmatory tests and analytical studies, the BWR/6 concept can be successfully engineered to provide an acceptable boiling water reactor design.

Sincerely yours,

C. P. Siess
Chairman

References Attached.

References - BWR/6

1. General Electric Topical Report NEDO 10569A BWR/6 Nuclear System from General Electric -- A Performance Description

2. General Electric Company Licensing Topical Report NEDO-10565, Testing of Cruciform Control Rods for BWR/6

3. General Electric Company Licensing Topical Report NEDO-10602, Jet Pump Testing for BWR/6