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: REPORT ON BROWNS FERRY NUCLEAR PLANT, UNIT 1

Dear Dr. Schlesinger:

At its 149th meeting, on September 14-16, 1972, the Advisory Committee on Reactor Safeguards completed its review of the application by the Tennessee Valley Authority for authorization to operate Browns Ferry Nuclear Plant Unit 1 at power levels up to 3293 MW(t). This project had been considered previously at the Committee's 147th and 148th meetings, July 13-15 and August 10-12, 1972, and at Subcommittee meetings at the site on June 20, 1972, and in Washington, D. C., on July 12, August 8, and September 12, 1972. During its review, the Committee had the benefit of discussions with representatives of the Tennessee Valley Authority, General Electric Company, the AEC Regulatory Staff, and their consultants. The Committee also had the benefit of the documents listed. The Committee reported to the Commission on the construction of this unit in its report of March 14, 1967.

The Browns Ferry Nuclear Plant is located in a sparsely populated area on the shore of Wheeler Lake approximately 30 miles west of Huntsville, Alabama. The plant is composed of three units. The units employ General Electric boiling water reactor nuclear steam supply systems of essentially identical design. The estimated completion date of Unit 2 is approximately eight months after Unit 1, and that for Unit 3 is about seven months after Unit 2. This report deals only with Unit 1.

The Browns Ferry reactors have essentially the same power density and linear heat generation rate as the Vermont Yankee reactor (the Committee reported on operation of this reactor in its letter of March 9, 1971), but have the highest power level of any boiling water reactor reviewed for operation to date. The reactor core design has been substantially modified from that proposed at the construction permit stage, and employs five different fuel enrichments as well as gadolinia bearing rods for reactivity control augmentation (instead of boron-steel control curtains).

Some of the gadolinia rods are uniformly axially loaded and are similar to those used in the Quad Cities reactors (ACRS operating license report of March 9, 1971). Others, however, are non-uniformly loaded (part-length) and their use in Browns Ferry Unit 1 will represent the first application in a commercial reactor.

Analyses of postulated control rod drop accidents recently have been revised by the applicant to employ a more realistic rate of reactivity insertion than formerly assumed, and to account for the changes made in the core design, in particular the use of a number of fuel enrichments and employment of full and part-length gadolinia-bearing fuel rods. These analyses indicate that, for accidents occurring during certain portions of the fuel cycle, the results are unacceptable. The applicant has proposed possible changes in plant design or operating procedures which he believes would render the probability of occurrence of such an accident negligibly low. The general approach appears feasible; however, details of the proposal are not yet available and will require thorough evaluation after submittal. This matter should be resolved in a manner satisfactory to the Regulatory Staff and the Committee. Approved measures should be placed into effect prior to operation above 1% of rated power.

Four diesel-generator sets have been provided for emergency power. Originally, the applicant planned to have these sets serve all three units of the plant. However, in order to reduce diesel-generator loadings, lessen the extensive interrelationship among the units' control circuits, and reduce the required amount of operator coordination, he recently proposed a modification which provides for sharing of these sets between Units 1 and 2 only, with four additional diesel-generator sets to be provided at a later date for Unit 3. The final design details of the proposed modification will not become available for several months. The Committee believes that the modified arrangement, which involves negligible change in Unit 1, is satisfactory for Unit 1 operation. After submittal of the system design details, review of the adequacy of the modification in regard to operation of Units 2 and 3 will be made by the Regulatory Staff and the Committee.

The applicant proposes to provide flood protection for the plant which includes protection to elevation 578.0 feet for the reactor building, radwaste building, diesel-generator building, and the Residual Heat Removal Service Water pumps on the intake structure. This elevation represents a probable maximum flood elevation of 572.5 feet plus wave runup associated with a sustained wind of 45 miles per hour. The applicant states that all flood protection features for Unit 1 will be completed prior to operation of Unit 1 above 1% power. The Committee finds these provisions satisfactory.

For control of combustible gas concentrations in the containment following a postualted loss-of-coolant accident, the applicant proposes use of a containment atmospheric dilution (CAD) system. With this system the desired dilution is accomplished by controlled addition of nitrogen, and results in the maintenance of higher containment pressure during a portion of the post-LOCA period than would otherwise exist. The Committee believes that, in general, use of such dilution schemes, which involve repressurization of the containment, is not desirable. However, as a backfitted provision on a plant well along in construction, use of this approach is believed by the Committee to be acceptable. The Committee nevertheless recommends that the applicant study means to assure that the peak repressurization pressure will be limited to a value substantially below the containment design pressure.

The inservice inspection program proposed for the reactor coolant system complies with Section XI of the ASME Boiler and Pressure Vessel Code to the extent permitted by the existing design. The Committee believes the program is acceptable, but recommends that the applicant continue to study means of assuring reactor vessel integrity in regions currently inaccessible for inspection.

The applicant proposes to employ recirculation pump trip as a means of limiting the consequences of the unlikely occurrence of a filaure to scram during anticipated transient. The Committee believes that this recirculation pump trip represents a substantial improvement and should be provided for Unit 1 prior to the start of commercial power operation. The specific means employed for implementing the pump trip should be resolved in a manner satisfactory to the Regulatory Staff.

Other problems relating to large water reactors which have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports, 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 pre-operational testing, there is reasonable assurance that the Browns Ferry Nuclear Plant Unit 1 can be operated at power levels up to 3293 MW(t) without undue risk to the health and safety of the public.

Sincerely yours,

/s/

C. P. Siess
Chairman

References Attached.

References

1. Tennessee Valley Authority letter dated September 23, 1970 transmitting FSAR, Volumes 1 through 5 to Browns Ferry Nuclear Power Station Units 1, 2 and 3

2. Amendments 10 through 40 to the License Application for Browns Ferry Nuclear Power Station Units 1, 2 and 3