

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

September 16, 1957

Honorable Lewis L. Strauss
Chairman, Atomic Energy Commission

Dear Mr. Strauss:

Pursuant to Section 182 of the Atomic Energy Act of 1954, as amended, this letter constitutes the report of the Advisory Committee on Reactor Safeguards with respect to the application for a construction permit by the Yankee Atomic Electric Company, Docket No. 50-29.

The proposed reactor is a pressurized light water reactor, which is designed to produce 492 megawatts of heat and 134 megawatts of electrical power, to be located near Rowe, Massachusetts,

There are three novel features of the reactor that bear on the safety of the system chosen. These are:

1. The addition of neutron absorbers.
2. Intentional design into the reactor of nucleate boiling.
3. Large plutonium build-up,

Experimental programs have been proposed by the applicant to establish the effect of these three novel features. These programs are to determine whether any undesirable instabilities could result from these modifications of pressurized light water systems, with which satisfactory operating experience is available. We regard these experimental programs, together with one additional one discussed below, as being the most important from the standpoint of ensuring the safety of the design finally adopted. They are, respectively:

1. Experimental studies of the conditions under which solid phases form when aqueous solutions containing a suitable corrosion inhibitor and nuclear poison are exposed to reactor radiation at the temperature and pressures of the proposed reactor. These studies should be carried to a point to establish that no significant amounts of poison-containing deposits will form in the reactor under the operating conditions finally adopted.

2. The part-core critical experiments. These studies should be completed and the results correlated. This information should be used in determining the final design of the reactor core.
3. Studies on the effect of the plutonium isotope build-up on the reactivity, flux distribution, temperature coefficient and void coefficients. The applicant's proposal to investigate data from Hanford and Savannah River on these effects of plutonium and to prepare synthetic fuel elements containing long-exposure plutonium and to measure their effect on reactivity in the part-core critical assembly are especially important. These studies should be completed and the information from these studies should be used in determining the final design of the reactor.

The other important experimental program is as follows: In arriving at the final design parameters, it is recommended that the design criteria be so chosen as to prevent the attainment of the burnout heat flux under abnormal, but credible, transient conditions. The relevant criteria are those concerned with temperature and void coefficients and flux each as a function of position with the reactor. It is likely that all of the pertinent design factors may not be confirmed until critical experiments are actually carried out in the power reactor itself. It is important that the applicant conduct the critical experiments proposed and make use of the results of these critical experiments in arriving at the final design of the control instrumentation and in establishing the operating conditions for the reactor.

The Committee is convinced that a reactor of the general type proposed in the application and amendments can be operated at the proposed location with an acceptably low risk of any injury to the health and safety of the public. By this, we mean that the possibilities of any incident which could cause such injury are remote and the consequences of such an incident in terms of endangering the health and safety of the public would be in our judgment low.

The Committee in reaching its generally favorable opinion regarding the safety of the proposed reactor has been influenced by the following considerations: the design parameters of pressurized light water reactors are largely known; the reactor is provided with a containment sphere which the applicant states will be sealed tightly during operation, and we are certain that it can be; the site appears to be adequate with respect to meteorology, hydrology and isolation.

Further, we are confident that the safety aspects of the novel features of the proposed reactor can be satisfactorily resolved by incorporating suitable design features which ought to result from the general type of experimental program proposed by the applicant. Since these programs have not been presented to us in detail, we cannot be entirely assured of their adequacy. Therefore, we have suggested above, as to those programs that are of major importance, the kind of conclusion to which they should be carried.

The Committee's conclusions are based on a reactor of the general design features specified in the application and amendments. However, it must be recognized that development work on the reactor is still in progress and that further experimental and theoretical studies are proposed to be accomplished before the detailed design of this reactor is finalized. Therefore, before the Committee could recommend approval of the operation of the reactor, it would have to review the detailed design, the results of the experimental programs, and other information which subsequently might be developed and have a bearing on this particular reactor.

I have been authorized by the Advisory Committee on Reactor Safeguards to submit this report to you.

/s/ Reuel C. Stratton

Reuel C. Stratton
Vice Chairman
Advisory Committee on Reactor Safe-
guards