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

September 8, 1980

ACRS-08-95

Honorable John F. Ahearne
Chairman
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Ahearne:

SUBJECT: SEQUOYAH NUCLEAR POWER PLANT, UNITS 1 AND 2

In connection with the Committee's review of the Sequoyah Nuclear Plant, Commissioner Gilinsky has addressed specific questions to the ACRS regarding ice condenser containments. This is in response to your request for the Committee's comments on the questions raised by Commissioner Gilinsky in his letter of August 7, 1980.

1) "Does the Committee believe additional hydrogen control measures are necessary for ice condenser containments?"

An intensive review of the capability of the Sequoyah containment has recently been completed. Independent estimates have been made by the Applicant, the NRC Staff, various consultants, and the ACRS Subcommittee on Structural Engineering. As a result, it has been concluded that the Sequoyah containment is capable of sustaining a pressure of at least 45 psig without structural failure. On this basis, the containment structure could tolerate burning of all the hydrogen evolved from the oxidation of 20%, or so, of the zirconium in the reactor, assuming the hydrogen was uniformly distributed in the containment atmosphere. Hence, there is a range of accidents involving severe core damage for which additional hydrogen control measures are not necessary. Of course, it would also be necessary to ascertain that all the essential equipment in the containment could withstand such an event. TVA has stated that they are conducting a thorough review of this matter.

For a full scale core meltdown there is no assurance that failure of the containment could be avoided merely by the use of hydrogen control measures. For events involving more than about 30% oxidation of the zirconium, hydrogen control measures may be necessary to avoid containment failure.

A similar situation, though not identical in detail, would be expected to apply to ice condenser plants other than Sequoyah.

The Committee believes that it would be prudent to provide additional hydrogen control measures for ice condenser containments, and that studies to demonstrate the effectiveness, reliability, and absence of significant adverse effects of candidate measures should be pursued actively on a time scale that would permit their application before more than a few additional reactor

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years of operation of ice condenser containment plants have elapsed. As stated in our Sequoyah Report of July 15, 1980, in the Committee's opinion, there is no need to delay the issuance of a full power operating license for Sequoyah until these studies have been completed.

2) "Is the Committee reasonably persuaded of the effectiveness of distributed igniters in ice condenser containments? Can such igniters be counted on to keep pressure increases caused by hydrogen burns at suitably low values -- which I would define as design pressures -- during accident sequences involving TMI-like quantities of hydrogen?"

On the basis of the preliminary information available, it appears that a distributed ignition system of the type considered for Sequoyah may provide a good capability of controlling the burning of a large amount of hydrogen. It is yet to be established at just what hydrogen concentration a particular style of igniter will provide ignition with high reliability under the conditions anticipated. With the assumption that it can be shown that this concentration is little, if any, higher than the average when the burn occurred at TMI-2, the pressure levels induced by iterated ignition would be well within the 45 psig capability of the Sequoyah containment. There is no present basis for assurance that the pressure increases can be held below the design pressure -- nor would there seem to be any need to do so under the circumstances considered. The hoped for, and expected, performance would be capable of disposing of all the hydrogen that might present itself, up to the point (about 800 kg burned) at which the oxygen level in the containment atmosphere should drop to about 5%, after which no further hydrogen could burn. This, of course, would depend on the continuing operation of the containment heat removal systems.

The action of the igniters will probably reduce the risk, since there will be at least as many ignition events with them in use as if only unintended ignition sources were present. The average amount of hydrogen per burning event should therefore be smaller, and the chance that a large pocket of ignitable or detonable hydrogen could survive without ignition (while waiting for a random source to act) will be reduced.

The results of the present testing program will, of course, be necessary before concluding that the ignition system being studied meets all the necessary objectives.

Sincerely,

Milton S. Plesset

Milton S. Plesset
Chairman

References

1. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the Operation of Sequoyah Nuclear Plant, Units 1 and 2," USNRC Report NUREG-0011, Supplement No. 2, August 1980

2. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the Operation of Sequoyah Nuclear Plant, Units 1 and 2," USNRC Report NUREG-0011, Supplement No. 3, September 1980

3. Letter from Commissioner V. Gilinsky to M. Plesset, Chairman, Advisory Committee on Reactor Safeguards, dated August 7, 1980