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YANKEE ATOMIC ELECTRIC COMPANY

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November 10, 1978

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Office of Nuclear Reactor Regulation

Reference: (1) License No. DPR-3 (Docket No. 50-29)
(2) Proposed Change No. 117, Supplement No. 3, Enclosure A, "Supporting Analysis Concerning Core Boron Concentration Following a Loss of Coolant Accident," (July 8, 1975)

Dear Sir:

Subject: Yankee Rowe Boron Concentration Upper Limit During Hydrostatic Testing of the Reactor Vessel and Low Power Physics Test

A supporting analysis concerning the core boron concentration following the unlikely event of a LOCA occurring during the reactor vessel hydrostatic test or zero power physics test is discussed herein. Reference 2 above addressed the core boron concentration following a LOCA. Given an initial volume - weighted boron concentration of 2314 ppm (main coolant system, safety injection tank and safety injection accumulator) prior to a LOCA, Reference 2 determined that there was no potential for the core boron concentration to reach the solubility limit, provided that hot leg injection be initiated between 20 and 24 hours after a LOCA. During the reactor vessel hydrostatic test or low power physics test, however, the core boron concentration is nominally 2250 ppm. In these situations, the volume - weighted boron concentration may exceed 2314 ppm since Safety Injection Tank boron concentrations may be upwards of 2400 ppm.

The reactor vessel hydrostatic test is normally conducted at the end of a refueling outage anywhere from six to ten weeks after shutdown. The main coolant system is essentially in the hot standby condition. A maximum of 40 exposed fuel assemblies are in the core at that time. Low power physics testing is performed just prior to startup. The rate at which boron would concentrate in the core following a LOCA is a function of decay heat. In the specific case of a LOCA during the hydrostatic test or low power physics testing, the driving force (decay heat) is at an insignificant level when compared to the decay heat produced after shutdown of a reactor with an infinite operating history. It is clearly evident that the 2314 ppm boron limit, which is based on the decay heat produced after the shutdown of a reactor, with an infinite operating history, is overly conservative in this case.

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Phase 1 of Reference 2 calculated the core boron concentration as a function of time following a LOCA from full power. It has been reanalyzed for the specific and unlikely case of a LOCA occurring during the period of reactor vessel hydrostatic test or low power physics test. The assumptions made for Phase 1 in this instance which are different from those stated in Reference 2 are as follows:

1. The reactor has been shutdown for 30 days refueling and has been reloaded with 36 fresh fuel assemblies. (11)*

2. Decay heat is assumed to be constant and equal to 0.78 MW (Decay heat level at 30 days plus uncertainties). (10)*

3. The rate of cold leg injection flow actually reaching the core is assumed to be constant and is based on the amount of fluid boiling off at the power level in 2 above. (5)*

4. The initial sump and core boron concentration is 3000 ppm. (Volume-weighted average of the main coolant system, safety injection tank, and safety injection accumulator). (4)*

5. The boron concentration of the injection water reaching the core is conservatively assumed to be a constant 3000 ppm. (3)*

* The numbers in parentheses refer to the specific assumption in Phase 1 of Reference 2. All other assumptions in Phase 1 of Reference 2 are also applicable to this analysis.

With the above assumptions, the time it would take for the core boron concentration to reach the solubility limit of 47,500 ppm @ 212°F was conservatively calculated to be 91 hours.

Hot leg injection initiated between 20-24 hours following a LOCA occurring during the reactor vessel hydrostatic test or low power physics test (with an initial volume-weighted boron concentration of 3000 ppm) will more than amply preclude the core boron concentration from reaching the solubility limit (See Phase 2 of Reference 2).

We trust you will find this information satisfactory; however, should you desire additional information, feel free to contact us.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

D E Vandenburgh

D. E. Vandenburgh
Senior Vice President

WJS/em