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# YANKEE ATOMIC ELECTRIC COMPANY

1671 Worcester Road, Framingham, Massachusetts 01701

2.C.2.1
FYR 82-104

October 29, 1982

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

Attention: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing

References: (a) License No. DPR-3 (Docket No. 50-29)
(b) YAEC Letter to USNRC, dated October 15, 1982 (FYR 82-102)

Subject: Additional Information for Proposed Change #179

Dear Sir:

Reference (b) submitted a proposed change to the Yankee Technical Specifications requesting a change to the minimum flow required for residual heat removal during Mode-6 operation (refueling). The current Technical Specification specifies, during Mode-6 operation, that a flow rate of 950 gpm in the Residual Heat Removal System is required to adequately remove the core decay heat and to prevent stratification of boron concentration. Due to a recent plant modification on the flow control valve, the actual available flow rate has decreased to approximately the Technical Specification limit.

This decrease in flow rate has been discussed with your Staff and Region I. Furthermore, a plan has been outlined and appropriate actions taken to further determine the cause of the flow decrease. Establishing a reduced value in the Technical Specification would eliminate the inflexibility in the current specification and alleviate the potential for an unnecessary LER condition; therefore, an evaluation has been performed to determined the minimum required flow rate.

The analysis performed was based on data for Mode-6 operation with the following operating conditions assumptions imposed:

- o core decay heat below 2.06 Mw (corresponding to 5 days after shutdown)
- o reactor vessel pressure near 15 psia
- o reactor vessel water temperature less than 140°F
- o Sherman pond water temperature is 81°F
- o a single pump in each loop, i.e., Service Water, Component Cooling, and Shutdown Cooling, is available



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Two different flow rates in the Residual Heat Removal System were analyzed: 1) the minimum available flow rate, and 2) the minimum required flow rate to meet Technical Specification on the maximum vessel water temperature of 140°F. In both cases, a minimum available flow rate in the Service Water and Component Cooling Loops was used. The minimum available flow rate was defined as the flow rate obtained by a pump minus the flow rate through all other paths not directly connected to the heat exchangers removing core decay heat. Inlet and outlet temperatures of both heat exchangers are schematically shown in Figure 1 for both cases. An absolute minimum flow rate in the Residual Heat Removal System was estimated to be 770 gpm, so that a flow rate of 850 gpm would be sufficient to keep the vessel water temperature from exceeding 140°F.

Furthermore, under the reduced flow rate (850 gpm), stratification of the boron concentration is not expected to occur. This conclusion is based on recent LOFT test results. The LOFT test results show that effective boron migration occurs even at near stagnant flow conditions.

The conclusions from this analysis demonstrate that there would be no adverse affect on safety at the reduced flow rate of 850 gpm in the Residual Heat Removal System. Additionally, the analysis demonstrates that 1) a reduced flow rate of 850 gpm is sufficient to keep the maximum reactor vessel water temperature from exceeding the Technical Specification value of 140°F, and 2) stratification of the boron concentration will not occur for a flow rate of 850 gpm.

We trust this information is satisfactory; however, if you have any questions, please contact us.

Very truly yours,

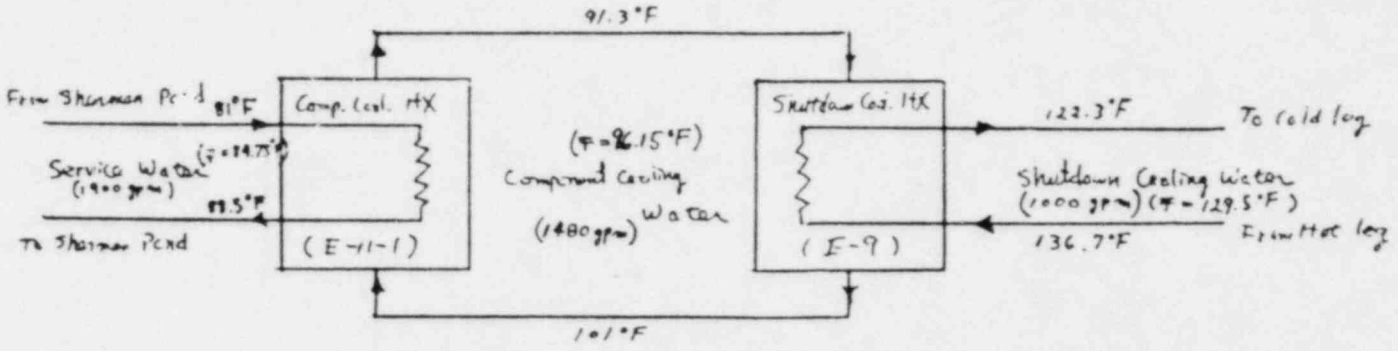
YANKEE ATOMIC ELECTRIC COMPANY

J. G. Kay

J. A. Kay
Senior Engineer - Licensing

JAK/ba

Case: Minimum Available Flow Rates




Case Minimum Required Flow in Shutdown Cooling

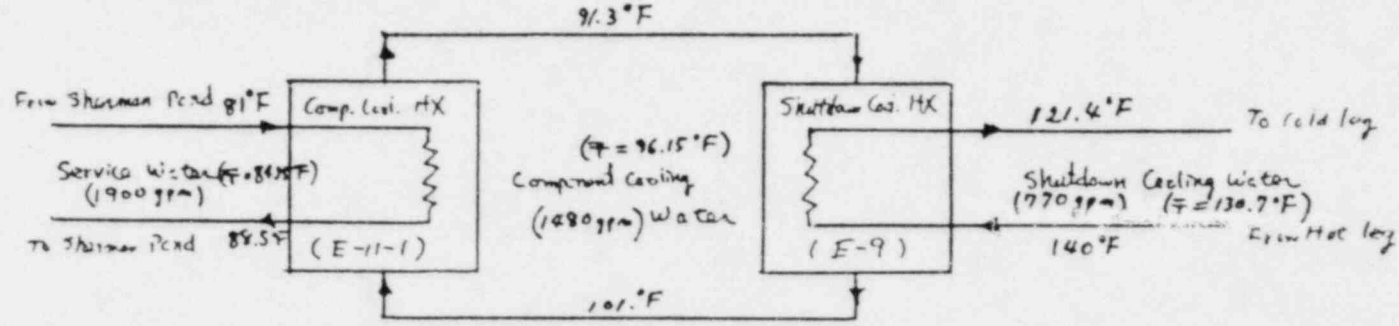



FIGURE 1