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SEP 13 1993

U.S. Nuclear Regulatory Commission
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Gentlemen:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) - ANALYSIS SUPPORTING BORON INJECTION TANK (BIT) CONCENTRATION REDUCTION (TAC M80152)

This letter responds to a request from the NRC staff to explain the basis of the accident analysis that was used to justify the design change for BIT boron concentration reduction. In particular, the letter describes how provisions for superheated steam were incorporated into the main steam line break (MSLB) analysis that is presented in Final Safety Analysis Report (FSAR) Section 6.2.1.3.10. The information was requested through an informal question from the NRC staff to assist in their review of the subject design change. The question was sent by facsimile to TVA on July 20, 1993, and further discussed in a telephone conversation with Mr. Bill Long and Mr. Peter Tam of the NRC staff on July 29, 1993.

The NRC staff question was stated as follows:

> "In a letter dated May 2, 1984, TVA forwarded a report entitled "Report for the BIT Concentration Reduction/BIT Elimination Study for Watts Bar Units 1 and 2" dated August 1983. Due to the date of the 1983 report, it is not clear whether the analysis described therein was performed using the approved versions of the LOFTRAN/LOTIC-III codes modified to account for superheat effect. The 1983 figure for the limiting lower compartment temperature break event (i.e., 0.6 ft^2 split, 30% power with AFW runout) appears to be identical to the figure incorporated into the FSAR as Figure 6.2.1-73 in Amendment 69. Please explain why the 1983 analysis, for which superheat was treated as a separate, independent issue (and thus may not have been considered), resulted in the same

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compartment temperature response curve as is currently depicted in the FSAR as including both superheat and BIT elimination effects."

The report enclosed with TVA's letter dated May 2, 1984, provided analytical justification for eliminating the function of the BIT. The hardware implementation of this design change at WBN did not actually remove the BIT, but rather reduced its boron concentration to less than 4 weight percent (equivalent to the boron concentration in the refueling water storage tank) so that there is no need for heat tracing and recirculation of the BIT. The letter dated May 2, 1984, also included FSAR page markups showing the changes associated with BIT concentration reduction. However, as stated in the letter, changes to FSAR Chapter 6 were withheld pending resolution of the "superheat" issue, which TVA considered to be independent of BIT concentration reduction, but which would require other changes to Chapter 6. The Chapter 6 changes for BIT concentration reduction were eventually added to WBN's FSAR as part of Amendment 69, which was submitted to NRC on January 21, 1992.

The "superheat" issue evolved over several years and consisted of two phases. The first phase resulted in modifications to the LOTIC computer code that allowed it to calculate containment temperatures in the superheated range. The modified computer code, called LOTIC-III, calculated a peak containment temperature of about 327°F in the lower compartment for a MSLB inside containment at WBN. The 1983 report that was enclosed with the TVA letter dated May 2, 1984, used this version of the LOTIC-III code, in conjunction with mass and energy release data calculated by the LOFTRAN code, to justify BIT concentration reduction. This report was completed prior to resolution of the second phase of the superheat issue, which involved accounting for the effect of steam generator (SG) tube bundle uncovery. Subsequent preliminary reanalysis of a MSLB inside containment with changes to incorporate superheating due to SG tube bundle uncovery calculated a peak lower compartment temperature of about 370°F.

At the same time computer modeling changes were developed to address the second phase of the superheat issue, the LOTIC-III model was made more realistic by including the effect of ice condenser drains. Previously, no credit was taken for cooling from the melted ice that drains from the ice condenser during a MSLB event. This cooling offsets the added heating from the release of superheated steam. A LOFTRAN/LOTIC-III analysis of a MSLB inside containment for WBN calculated a peak lower compartment temperature of 313°F when BIT concentration reduction, superheat, and ice condenser drains were all considered together. This analysis is documented in Westinghouse Topical Report WCAP-10986, "Ice Condenser Drain Test Results, Data Analysis, and Development of Drain Flow Models for the LOTIC-III Ice Condenser Code," dated November 1985, and WCAP-10986 Addendum 1, "Reanalysis of Watts Bar and Catawba Containment Temperatures in Response to LANL Evaluation of LOTIC-III Heat Transfer Models," dated August 1988. The NRC staff accepted TVA's resolution of the superheat issue for WBN in a safety

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evaluation issued on April 24, 1991, based in part on application of the approved methodology from WCAP-10986.

The MSLB analysis results that are currently described in FSAR Section 6.2.1.3.10 and shown on Figure 6.2.1-73 are based on the 1983 BIT concentration reduction report that was enclosed with the letter dated May 2, 1984. This analysis approach gives a calculated peak temperature of about 327°F for the lower compartment in containment. It would be possible to justify a reduced peak temperature (i.e., 313°F) for the lower compartment based on the results of MSLB analysis in WCAP-10986. However, TVA has chosen to use the earlier MSLB analysis results as WBN's licensing basis because they are conservative with respect to results obtained with WCAP-10986 methodology and because most of WBN's environmental qualification of equipment in containment is based on a peak temperature of 327°F.

In summary, FSAR Chapter 6 presents containment effects that bound the most recent analysis of a postulated MSLB inside containment. This most recent MSLB analysis does include appropriate provisions for both BIT concentration reduction and superheat (as well as ice condenser drains).

If you have any questions about the information provided in this letter, please telephone John Vorees at (615) 365-8819.

Very truly yours,

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