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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) - RESPONSES TO QUESTIONS CONCERNING CHANGES TO CHAPTER 15 IN FINAL SAFETY ANALYSIS REPORT (FSAR) AMENDMENT 71 (TAC M84234)

This letter responds to four questions from the NRC staff concerning changes that were made in FSAR Amendment 71 to various accident analysis descriptions in Chapter 15. The questions were telecopied to TVA on May 25, 1993, and then discussed in a telephone conversation on June 7, 1993, with Mr. Peter Tam and Mr. Tai Huang of the NRC staff. TVA previously responded to a series of questions on the same subject in a letter dated March 16, 1993.

1. Question:

In FSAR Table 15.1-3 Sheet 2, the limiting trip point assumed in the analysis for the low-low steam generator (SG) level trip function was changed from "0% of narrow range span between 0 and 20% nominal load, and increasing linearly to 49% of span at 100% of nominal load" to "0% or 9% of narrow range span depending on the particular accident." The particular accident corresponding to either 0% or 9% should be identified.

Response:

This change to Table 15.1-3 Sheet 2 in FSAR Amendment 71 deleted the trip point assumption of "0% of narrow range span between 0 and 20% nominal load, and increasing linearly to 49% of span at 100% of nominal load" because this assumption had not been used to perform any relevant accident analyses for many years. WBN's most recent analysis of a main

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feedwater line break accident, which was performed by Westinghouse several years prior to Amendment 71, assumed a trip point of 0% of narrow range span. Westinghouse had also previously evaluated a loss of normal feedwater event and a station blackout event for WBN using an assumed trip point of 9% of narrow range span. Either of these trip point assumptions was conservative with respect to the actual low-low SG level trip setpoint, which at that the time of the analyses was 17% of narrow range span between 0 and 35% nominal load, and increasing linearly to 54.9% of narrow range span at 100% of nominal load.

Recently, WBN upgraded its reactor control and protection electronics by installing Westinghouse's digital Eagle-21 process protection system. As part of this Eagle-21 design modification, the actual low-low SG level trip setpoint was changed to 17% of narrow range span at all loads. Both of the earlier trip point assumptions of 0% and 9% remained conservative with respect to the new trip setpoint of 17%. However, Westinghouse decided to adopt a more consistent analytical approach with maximum conservatism and reevaluated all affected accident analyses using only an assumed trip point of 0%. FSAR changes related to the new Eagle-21 system were incorporated in Amendment 72. One of these Amendment 72 changes was another revision to the limiting trip point assumption in Table 15.1-3 Sheet 2 so that it now reads "0% of narrow range span."

2. Question:

Identify those plants using the method described in Westinghouse letter NS-TMA-2273 for analyzing uncontrolled boron dilution. Provide boron dilution analyses for the following plant conditions: hot standby, hot shutdown, and cold shutdown. Include a summary of alarms that will alert an operator to the dilution event.

Response:

Uncontrolled boron dilution is analyzed for WBN using methodology developed by Westinghouse. This methodology was originally described in Westinghouse letter NS-TMA-2273 to NRC dated July 8, 1980 ("SUBJECT: Boron Dilution Concerns at Cold and Hot Shutdown"). As part of the methodology, Westinghouse developed an "interim operating procedure," which was enclosed with the above letter, to ensure sufficient operator action time in the event of an uncontrolled boron dilution in Modes 4 (hot shutdown) and 5 (cold shutdown). Westinghouse has told TVA that they never received a direct response from NRC approving this methodology, but that it has been used as the basis for analyzing uncontrolled boron dilution at many other Westinghouse plants such as Donald C. Cook, Joseph M. Farley, Indian Point, Salem, and Sequoyah.

In 1989, Westinghouse notified TVA of a revision to the above interim operating procedure and the associated methodology for analyzing

uncontrolled boron dilution. This revision expanded the applicability of the methodology to reload fuel cycles and supported greater operational flexibility in Modes 4 and 5. The revised interim procedure also addressed the difference in the density of unborated makeup water as compared to the density of the reactor coolant. FSAR Amendment 71 updated Section 15.2.4 to incorporate the revised uncontrolled boron dilution analysis. Mode 3 (hot standby) conditions were not considered in either the revised analysis or the earlier analysis since they are bounded by the more limiting conditions of Modes 4 and 5. In Mode 3, at least one reactor coolant pump must be in operation. This ensures rapid mixing within the reactor coolant system so that the effects of boron dilution occur more slowly.

The principal alarms available to alert an operator to an uncontrolled boron dilution event are discussed in Sections 15.2.4.3.1 and 15.2.4.3.2. A complete list of the alarms and indications that are available to alert an operator to a dilution event in Modes 3, 4, and 5 includes:

- Meter indication of boric acid flow rate and blended flow rate
- Boric acid or blended flow rate deviation alarms
- Chemical and volume control system pump status lights
- High flux at shutdown alarm
- Increase in source range neutron flux count rate as indicated visually by meter and audibly by speaker
- Source range reactor trip

3. Question:

What is the reason for replacement of the PHOENIX computer code with the LOFTRAN computer code in FSAR Section 15.3.4.2?

Response:

Details of LOFTRAN are provided in FSAR Section 15.1.9.4 and in Westinghouse Topical Report WCAP-7907-P-A. Details of PHOENIX are provided in FSAR Section 15.1.9.8 and in WCAP-7973. In summary, LOFTRAN is a complex, integrated computer code that calculates both the thermal-hydraulic and the neutron power effects of a reactor transient. PHOENIX is an older and more limited code that was used only to calculate reactor core and loop flows. PHOENIX has not been used to perform any WBN accident analyses for many years since LOFTRAN effectively incorporates its calculational capabilities.

Westinghouse reanalyzed the complete loss of forced reactor coolant flow accident more than 4 years ago to incorporate as-shipped reactor coolant pump performance data. This reanalysis used LOFTRAN, not PHOENIX. TVA updated FSAR Section 15.3.4.2 to include the method and results of the

reanalysis as part of Amendment 71. References to the PHOENIX code were eliminated since it was not used.

4. Question:

FSAR Figures 15.2-28A through 28F and Figures 15.2-42A through 43B in Amendment 71 appear to be the same as Figures 15.2-28, 15.2-42, and 15.2-43 in Amendment 70. What changed?

Response:

Figure 15.2-28 (split into 28A through F for Amendment 71) shows the transient response of various plant parameters for excessive heat removal due to feedwater (FW) system malfunctions. Figures 15.2-42 (split into 42A and B for Amendment 71) and 15.2-43 (split into 43A and B for Amendment 71) show the transient response of various plant parameters due to inadvertent operation of the emergency core cooling system (ECCS). There are only minor differences in these figures between Amendment 70 and Amendment 71. The general shapes of the transient response curves for the two accident analyses and the values of plant parameters that correspond to inflection points on these curves are virtually unchanged. There are, however, slight changes in the timing of many of the transient responses (i.e., some of the times at which maximum or minimum values occur are different).

The newer figures that were added by Amendment 71 did not result from recent reanalysis of either excessive heat removal due to FW system malfunctions or inadvertent operation of ECCS. Rather, these newer figures were added because they are traceable to the latest, documented Westinghouse accident analyses and the older figures are not. About 5 years ago, TVA recognized that some of the information provided in the FSAR--including the subject figures--could not be traced to approved design output documents and calculations. TVA initiated the Licensing Verification Program to correct this problem. As part of this program, Westinghouse was requested to review its records and update any of the questionable information in the FSAR to conform with the latest analyses and calculations that were on-file. The changes to Figures 15.2-28, 15.2-42, and 15.2-43 resulted from this effort.

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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