June 27, 1997

Mr. Oliver D. Kingsley, Jr.
President, TVA Nuclear and
Chief Nuclear Officer
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: WATTS BAR UNIT 1 - REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING PRESSURE-TEMPERATURE LIMIT REPORT (PTLR) AND ACCOMPANYING WESTINGOUSE OWNERS GROUP WCAP-14040 (TAC NO. M89048 AND M92336)

Dear Mr. Kingsley:

By letters dated March 10, 1994, December 23, 1994, and March 29, 1995, Tennessee Valley Authority submitted (1) Watts Bar Unit 1 Reactor Coolant System Pressure and Temperature Limits Report, Revision 3; (2) Westinghouse WCAP-13829, "Heatup and Cooldown Limit Curves for Watts Bar Unit 1," Revision 1; and (3) Westinghouse WCAP-14040, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves," Revision 1. The staff has reviewed this information and has developed several questions, as delineated in the enclosure.

Please respond within 20 days of receipt of this letter. This stringent schedule is needed to meet the proposed fuel loading date of September 24, 1995. The requirement affects nine or fewer respondents and, therefore, is not subject to the Office of Management and Budget review under P.L. 96-511.

Sincerely,
Original signed by
Peter S. Tam, Senior Project Manager
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Request for Additional Information

cc w/enclosure: See next page

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REQUEST FOR ADDITIONAL INFORMATION
WATTS BAR UNIT 1
PRESSURE-TEMPERATURE LIMIT REPORT AND METHODOLOGY
(TAC M89048 AND M92336)

The staff requests additional information for Westinghouse Owners Group, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves," WCAP-14040, Revision 1:

1. On page 2-6, the bottom paragraph, WCAP-14040 states that "Plants that do not follow the fracture toughness requirements in Branch Technical Position MTEB 5-2 to determine IRT_{NDT} can use alternative procedures. However, sufficient technical justification must be provided for an exemption from regulations to be granted by the NRC." Commonwealth Edison Company's Zion Units 1 and 2 exemption for their WF-70 weld was cited as an example.

   The staff notes that in addition to the technical justification, the utility must show that special circumstances are present as described in 10 CFR 50.12. In the case of Zion Units 1 and 2, the staff acceptance of the alternative procedure was contingent on the analysis of a significant amount of fracture toughness data for the WF-70 weld metal. Acceptance of such a procedure in a case where little or no fracture toughness data were available would be difficult in the absence of an officially sanctioned consensus standard. In addition to this technical justification, the utility met the special circumstances criteria in 10 CFR 50.12(a)(2).

   The staff requests TVA modify the paragraph (on page 2-6) to emphasize that special circumstances must be present to justify an exemption to the rule. Also if Zion Units 1 and 2 is used as an example, TVA should clarify the staff's justification for approval of the exemption.

2. On page 2-8, below Equation 2.4-4, it should state where $f_{surface}$ (10^{19} n/cm^2, E>1 MeV) .... The staff requests that the revised text be inserted.

3. On pages 2-16 and 2-18, the flaw shape factor, Q, is calculated two separate ways during heatup and cooldown (once for the pressure term and once for the thermal term). Explain the reason for the use of two flaw shape factors and justify why a generic Q value for the combined effect was not used.

4. In Equation 2.5-1 in the report,

   $$Kia = 26.78 + 1.223 * \exp [0.0145 (T-RT_{NDT} + 160)] \qquad (2.5\text{-}1)$$

   The above number is shown as 1.223, whereas in the ASME Boiler and Pressure Vessel Code, Section XI, Appendix G, 1989 edition, the redlined number is shown as 1.233. The differences are also highlighted in WCAP-13829; where on page 3 the value used is 1.223 and on page 7 the value used is 1.233.

ENCLOSURE

The staff notes that in Welding Research Council, Bulletin 175 and in the NRC Standard Review Plan 5.3.2, the number is shown as 1.223. However, the WCAPs 14040 and 13829 reference the ASME code. Explain the discrepancy in your reports and justify the use of 1.223.

5. Demonstrate the method for determining the thermal stress intensity factor, K_{IT}, for heatup and cooldown. Specifically, provide a sample calculation of the process starting with Equation 2.6.1-1 on page 2-14. The sample calculation should be in sufficient detail to provide the staff a reproducible method for verifying the heatup and cooldown curves. The calculation should include the time-dependent temperature distribution determination (page 2-14), the use of the Timoshenko equation (pages 2-14 and 2-15), the determination of the thermal stresses (membrane and bending) employing the linearization technique from Appendix A of the ASME code (page 2-17), and the final value of K_{IT} using Equation 2.6.3-1 (page 2-17).

6. In Equation 2.6.3-3 (page 2-18) or Equations 2.6.4-1 and 2.6.4-2 (page 2-19) for cooldown and heatup respectively, the K_{Ia} input is calculated by using Equation 2.5-1 (page 2-10). The staff assumes the temperature input to Equation 2.5-1 is derived using the time-dependent temperature distribution solution described on page 2-14. If this is a valid assumption, demonstrate the use of Equation 2.6.3-3 or Equations 2.6.4-1 and 2.6.4-2 for cooldown and heatup respectively using the temperature distribution solution. If this is not a valid assumption, provide an explanation for the temperature value used in Equation 2.5-1 and subsequently the K_{Ia} used in Equation 2.6.3-3 or Equations 2.6.4-1 and 2.6.4-2.

7. The LTOP/COMS setpoints do not appear to include instrument error. Explain the absence of this factor and justify the exclusion of a margin for instrument error. (Westinghouse provided a response by letter dated June 16, 1995, which the staff is in the process of reviewing.)

The staff requests additional information for Westinghouse Owners Group, "Heatup and Cooldown Limit Curves for Normal Operation for Watts Bar Unit 1," WCAP-13829, Revision 1.

1. The pressure-temperature limits curves in Figures 1 and 2 do not include margins for pressure differences between the wide-range pressure transmitter and the limiting reactor vessel beltline region (stated on page 1). Justify the exclusion of the pressure differences for the heatup and cooldown curves.

2. On page 2, the staff requests the last sentence be revised to read "The post-irradiation fracture toughness properties of the reactor vessel beltline material will be obtained directly from the Watts Bar Unit 1 Reactor Vessel Radiation Surveillance Program."

3. On page 6, the staff requests the first paragraph reference WCAP-14040 directly to clarify the methods in obtaining the pressure-temperature limits.

The staff requests additional information for Watts Bar Unit 1 RCS Pressure Temperature Limits Report, Revision 3.

1. On page A-27 in note (c), the margin equation is quoted from Regulatory Guide 1.99, Revision 2, incorrectly. The equation should be multiplied by a factor of two. The values in the table reflect the correct equation. The staff requests TVA to correct the equation.

* In sample calculations, use values from Watts Bar Unit 1, P-T limits for 7 EFPY.

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