August 28, 2003

MEMORANDUM TO: Allen G. Howe, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Margaret H. Chernoff, Project Manager, Section 2***/RA/***
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: WATTS BAR UNIT 1 - REQUEST FOR ADDITIONAL INFORMATION AND RESPONSE CONCERNING REACTOR COOLANT SYSTEM FLOW MEASUREMENT USING ELBOW TAP METHODOLOGY (TAC NO. MB8992)

The attached four questions were electronically sent on June 30, 2003, to Mr. Charlie Touchstone of Tennessee Valley Authority (the licensee). The questions were transmitted to facilitate the technical review being conducted by the Office of Nuclear Reactor Regulation concerning the licensee's request to use the elbow flow tap methodology for reactor coolant system flow measurement. The licensee provided draft responses to the questions to facilitate discussions with the U.S. Nuclear Regulatory Commission (NRC) staff.

The questions and responses were discussed with the licensee during a phone call on July 17, 2003. During the conference call, it was noted that the responses provided either clarification or reference to information previously supplied by the licensee in their license amendment request or in documents previously reviewed and approved by staff. This memorandum documents the questions and final responses provided by the licensee.

This memorandum and the attachment do not convey or represent an NRC staff position regarding the licensee's request.

Docket No. 50-390

Attachment: As stated

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Request for Additional Information Regarding
Watts Bar Nuclear Plant Amendment Request
To Change Reactor Coolant System Flow Measurement
Using Elbow Tap Methodology
Dated May 14, 2003

Question 1:

In Enclosure 1 of Tennessee Valley Authority's (TVA or licensee) Watts Bar Nuclear Plant (WBN) license amendment request, the licensee stated the uncertainty associated with the Reactor Coolant System (RCS) low flow trip setpoint increased slightly but was still within the available margin for uncertainty. However, the licensee did not provide sufficient information to justify changing only the Allowable Value. The staff requests the licensee provide the technical basis for changing the RCS flow Allowable Value from 89.6 percent to 89.7 percent and leaving the trip setpoint the same.

Licensee Response to Question 1:

> The increase in the uncertainty associated with the RCS Flow - Low trip setpoint resulted from including additional uncertainties for the elbow taps which were previously zeroed out due to normalizing the RCS flow channels to the RCS precision flow calorimetric. Specifically, the uncertainty for this function increased from the current licensing basis value of [ ]% flow (Reference [Westinghouse Report] WCAP-12096, Rev. 8, Westinghouse Setpoint Methodology for Protection Systems, Watts Bar Unit 1, Eagle 21 Version) to [ ]% flow (WCAP-16067-P, Rev. 0) resulting in a corresponding decrease in the margin from [% to %]. Using the approved methodology described in WCAP-12096, the Allowable Value is calculated in two ways with the more conservative (limiting) value chosen. Also, since the value of 89.7% is more conservative than the current value of 89.6%, it can be conservatively applied using either the calorimetric or elbow tap flow measurement methods. Sufficient margin exists between the nominal trip setpoint of 90% and the safety analysis limit of 87% to accommodate the increased uncertainty without changing either the setpoint or the safety analysis limit.

The empty spaces within the brackets signify information that is proprietary. The values are provided in the proprietary version of the referenced WCAP.

Question 2:

The licensee's proposed Technical Specification (TS) change states that the use of either a calorimetric or elbow tap flow method is acceptable. The licensee's justification for changing TS bases from "% thermal design flow" to "% indicated loop flow" is to be consistent with wording found in the TSs for other nuclear plants. The licensee's proposed bases description of the TS change under Reactor Coolant Flow-Low section fails to discuss the calorimetric method for determining RCS flow. The staff requests the licensee define whether "% indicated loop flow" is meant to include the calorimetric method for determining RCS flow. If not, please

provide additional information justifying the removal of "% thermal design flow" from the TS bases.

Licensee Response to Question 2:

> The subject TS Bases sections that were marked up in TVA's submittal pertain to the Reactor Coolant Flow-Low Reactor Trip Function. These sections are generic and are not dependent on the method (elbow tap or calorimetric) used to verify RCS flow. The discussion of the Trip setpoint and Allowable Value, including the proposed Bases change, applies to both the calorimetric method and the elbow tap method of determining RCS flow. The changes were proposed to clarify that the Trip Setpoint and Allowable Value are referenced to the indicated loop flow since the flow channels are normalized to the indicated loop flow determined at the beginning of each refueling cycle. The Bases change is a clarification only as the flow channels will continue to be scaled and the setpoint adjusted in future cycles as in past cycles whether the calorimetric or the elbow tap method of determining RCS flow is used.

Question 3:

Confirm that the setpoint methodology used to calculate the RCS flow measurment for reactor trip allowable value has been reviewed and approved by the staff previously and provide reference to the Safety Evaluation where this review has been documented. If this review has not been completed, then provide the copy of your setpoint methodology along with two sample calculations for NRC staff's review and approval.

Licensee Response to Question 3:

> The staff has previously reviewed and accepted the methodology used to determine the RCS Flow-Low trip setpoint and allowable value. WCAP-12096, Rev. 6, Westinghouse Setpoint Methodology for Protection Systems, Watts Bar Unit 1, Eagle 21 Version, was submitted in support of initial Unit 1 licensing. The Staff's acceptance is documented in SSER 15 [Safety Evaluation Report (NUREG-0847)], June 1995, Section 7.1.3.1, "Safety System Setpoint Methodology." Subsequently, WCAP-12096, Rev. 7, was reviewed and accepted in support of WBN License Amendment 7, NRC SER dated September 11, 1997 (Page 4, Section 2.6). WCAP-12096, Rev. 8 did not affect the RCS flow uncertainty calculation and is not pertinent to this discussion. The methods used for the elbow tap method are the same as those accepted by the staff in these previous SERs.

Question 4:

Appendix A of the Westinghouse Report WCAP-16067-P, Table A-3, A-4, and A-5 use an equation to calculate uncertainties for calorimetric and elbow tap flow measurements. Explain how these calculations were performed and the basis for acceptability.

Licensee Response to Question 4:

The equations presented in tables A-3, A-4 and A-5 reflect how the individual uncertainty terms were combined to provide the final uncertainty for the flow calorimetric, control board indication, and computer indication. These calculations are performed using standard Westinghouse methods (which were previously approved by the NRC and which reflect the basic approach of NUREG/CR-3659) for RCS flow calorimetrics and indication uncertainties, such as Westinghouse Improved Thermal Design Procedure (ITDP) and Revised Thermal Design Procedure (RTDP) calculations. The standard Westinghouse method is applied to Watts Bar on a plant specific basis to reflect installed plant instrumentation and written plant procedures and processes for measurement of the various parameters. The equations reflect an SRSS [square root of the sum of the squares] approach with appropriate treatment for dependencies, loop values, system values, and number of instrument channels measured per loop. It is also noted that this method is the same as used for all Westinghouse elbow tap flow method calculations, such as those performed for Seabrook and Diablo Canyon. The addition of these equations to the tables in WCAP-16067-P represents an editorial only change when compared to previous submittals such as Seabrook and Diablo Canyon.

The methods used in WCAP-16067-P Revision 0 are the same as used for previous Watts Bar calculations. The basic approach equation was presented in Watts Bar WCAP-14419, Revision 0, page 14, *Westinghouse Instrument Uncertainty Methodology for Reactor Coolant System Flow Measurement*, in support of initial startup of WBN Unit 1, and was accepted by the NRC via SSER 16, September 1995. This equation was presented again in WCAP-14738 Revision 0, page 26, *Westinghouse Revised Thermal Design Procedure Instrument Uncertainty Methodology for Watts Bar Unit 1*, in support of cycle 2 operation, and was accepted via NRC SER for Amendment 7, September 1997. These documents use the same basic equation (i.e., combination of appropriate dependent terms, loop and system terms, number of loops, etc.) as the equation on Table A-3 of WCAP-16067. The equations are not identical, as they represent somewhat different instruments and procedures existing for the startup of Cycle 1, but they are the same in method. The equations for the indication uncertainties on Tables A-4 and A-5 are based on this same equation, modified to reflect two channels of indication per loop (for conservatism) and four primary side loops, and are the same as those used for the control board and computer indication uncertainty calculations documented in WCAP-14419 Revision 0 (Tables 5a and 5b, pages 25 and 26) and WCAP-14738 Revision 0 (Tables 7a and 7b, pages 38 and 39). Therefore, the equations on Tables A-3, A-4, and A-5 of WCAP-16067 do not represent a change in methodology and are consistent with previous submittals reviewed and accepted by the NRC.