Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

SEP 2 1 2001

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

In the Matter of) Docket No.50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING TRITIUM PRODUCTION - INTERFACE ITEM NUMBER 3 - COMPLIANCE WITH DNB CRITERION - TAC NO. MB1884

The purpose of this letter to provide TVA's response to NRC's request for additional information regarding the Tritium Production Program Interface Item Number 3, "Compliance With DNB Criterion." This request was made via email from NRC Project Manager for WBN on September 4, 2001, and was formalized in a subsequent letter dated September 14, 2001. Initial information related to this interface issue was supplied by TVA on May 1, 2001, and with the license amendment request dated August 20, 2001. The enclosure provides both the questions asked and the responses to those questions.

SEP 2 1 2001

There are no regulatory commitments made by this letter. If you have any questions about this letter, please contact me at (423) 365-1824.

Sincerely,

P. D. Pace
Manager, Site Licensing
and Industry Affairs

Enclosures
cc: See page 3

Subscribed and sworn to before me
on this 21st day of September, 2001

E. Jeannette Long
Notary Public

My Commission Expires May 21, 2005

cc (Enclosure):

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ENCLOSURE
TENNESSEE VALLEY AUTHORITY
WATTS NUCLEAR PLANT (WBN)
UNIT 1
DOCKET NO. 390
RESPONSE TO NRC'S REQUEST FOR ADDITIONAL INFORMATION

Question No. 1

"Westinghouse's report NDP-00-0344, Section 2.4.4.1, page 2-27, states that Westinghouse conducted detailed thermal/hydraulic evaluations to determine the effects of the TPBARs in the core. Please provide summarized results of these evaluations."

Response No. 1

The following calculations/evaluations were made:

A. A detailed calculation of the effect of the heat generation in the TPBAR on boiling in the guide thimble tubes that could occur when the TPBARs are placed in the fuel assembly thimble tubes was made. The following Westinghouse boiling criteria were satisfied:

1. There will be no surface boiling from the core component rod (TPBAR) within the dashpot region of the thimble tube. As discussed in Section 3.6 of NDP-00-0344, Revision 1, the maximum TPBAR surface temperature in the dashpot is ~600°F, which is well below surface boiling temperatures.

2. There will be no bulk boiling at any location within the thimble tube. As discussed in Section 3.6 of NDP-00-0344, Revision 1, the maximum bulk coolant temperature in the thimble tube is 652.4°F which is below the saturation temperature of 652.7°F.

B. Analyses were made comparing the axial power shapes expected to occur when TPBARs are in the core to the axial power shapes used in DNB safety analyses. The results showed that:

1. There is margin to the Condition I axial power shape used for the analysis of transients starting from normal operation at full power (See Figure 3.1.) and

2. There is margin to the Condition II axial power shapes used as a basis for the setpoint analyses. (See Figures 3.2A and 3.2B.)

C. A departure from nucleate boiling ratio (DNBR) evaluation was made of the Steamline Break Coincident with Rod Withdrawal at Power transient. The results showed that a core with TPBARs resulted in a DNBR penalty of 0.2% for thimble cells and no penalty for typical cells. There was sufficient unused DNB margin between the DNBR Design Limits and Safety Analysis Limits to account for this penalty.

D. The analysis of the Hot Zero Power Steamline Break transient showed a large margin to the DNBR limit.

E. The thimble bypass flow limits were met with core containing TPBARs. The design limit for bypass flow through the thimble is 2%, while the calculated core bypass flow for the tritium core designs described in NDP-00-0344, Revision 1 was 1.67%.

Question No. 2

Page 2-27, last paragraph, uses the terms such as "Bounding value," "Bounding axial," and "Generic power." This is very vague. Please give us more specific information and justification for picking the bounding values. Also, what does a generic power distribution look like? Is it flat, cosine, or top skewed?

Response No. 2

A bounding value of the enthalpy rise peaking factor ($F\Delta_H$) is the value corresponding to that referenced in the Technical Specifications. The bounding axial power distribution is that power distribution that gives the lowest DNBRs. A generic power distribution is a bounding power distribution that is used for the analysis of a number of plants. The generic power distributions are verified to be limiting for each cycle by comparing the results of DNBR calculations with the generic power distribution to the results of DNBR calculations with the cycle specific power distributions. The generic power distribution was selected based on experience with many analyses. The generic power distribution used to analyze transients that originate at full power normal operation such as Loss of Flow can be characterized as a slightly positive double-humped distribution and is given below:

(inlet) 0.3917,0.4324,0.7766,0.9995,1.1138,1.1497,1.1356,1.0452,
1.0631,1.0242,0.9853,0.9536,0.8530,0.9030,0.8946,0.8883,
0.8883,0.8277,0.8964,0.9198,0.9423,0.9679,0.9461,1.0239,
1.0809,1.1304,1.1809,1.2033,1.2434,1.3232,1.3543,1.3557,
1.3116,1.1691,1.0976,0.8945,0.6368,0.3842 (outlet)

Question No. 3

For the comparisons stated in the first paragraph of Section 2.4.4.5, on page 2-28, please provide the results of the comparisons (i.e., plots, sketches, etc.)

Response No. 3

Figure 3.1 shows the results of the analysis of the Condition I axial power shapes for an equilibrium core of TPBARs. Each circle or x corresponds to a power shape.

Figures 3.2A/B show the results of the analysis of the Condition II axial power shapes for an equilibrium core of TPBARs. Each point corresponds to a power shape.

Question No. 4

The second paragraph of Section 2.4.4.5 states that departure from nucleate boiling ratio basis have been met, and that bypass flow limits have been met. Please provide plots and sketches showing how much margin there is for the core with the TPBARs. Has the margin increased or decreased with the inclusion of the TPBARs?

Response No. 4

DNBR Design Basis

As indicated in Response 1C, there is a small DNBR penalty for the Steamline Break with Rod Withdrawal at Power for the thimble cell. Therefore, the margin between the DNBR Design Limit (DL) and the Safety Analysis Limit (SAL) for the thimble cell decreased slightly. The DNBR margin/penalty summary for the Watts Bar cores containing TPBARs is:

	thimble/typical cell
Revised Thermal Design Procedure (RTDP) DNBR Design Limits, DL	1.24/1.25
RTDP Safety Analysis Limits, SAL	1.38/1.39
Margin (M), M = 1 - DL/SAL, %	10.0/10.9
Rod Bow penalty	1.3/1.3
Lower plenum flow anomaly, %	3.3/3.3
1.4% power increase, %	3.3/3.3
Penalty for Steamline Break (SLB)/Rod Withdrawal at Power (RWAP), SLB/RWAP,%	0.2/0.0
Net remaining margin, %	1.9/2.1

Bypass Flow Limits

The TPBARs will be inserted into the fuel assembly thimbles. The effect of these on the total thimble bypass flow was calculated. The total design bypass flow was calculated to be 1.67%, which is the same as that calculated for the current cycle. This is less than the value of 2% which is used in analyses. This parameter is checked for every reload, since it can be impacted slightly by loading variations.

Question No. 5

The third paragraph of the same Section states that the analyses of the TPBAR component showed that the acceptance criteria have been met. What acceptance criteria are met? Where do you document (tabulate) that all the acceptance criteria are met?

Response No. 5

The acceptance criteria for the TPBAR component Thermal/Hydraulic analysis are documented in Section 3.6 of NDP-00-0344, Revision 1. The core Thermal/Hydraulic acceptance criteria associated with the TPBARs are related to DNBR, boiling in the thimble tubes, thimble bypass flow limits and the fuel melt criterion.

The acceptance criterion for the effect of the TPBARs on DNBR is that there is sufficient margin to cover any penalties. As shown in Response 4 above, the margins remaining between the DNBR Design Limits and the Safety Analysis Limits are 1.9% and 2.1% for the thimble cell and typical cell, respectively.

The thimble bypass flow limit of 2% was met with a calculated thimble bypass flow of 1.67%.

The acceptance criteria for the effect of the TPBARs on boiling in the thimbles were satisfied as follows.

1. There will be no surface boiling from the core component rod (TPBAR) within the dashpot region of the thimble tube. As discussed in Section 3.6 of NDP-00-0344, Revision 1, the maximum TPBAR surface temperature in the dashpot is ~600°F, which is well below surface boiling temperatures.

2. There will be no bulk boiling at any location within the thimble tube. As discussed in Section 3.6 of NDP-00-0344, Revision 1, the maximum bulk coolant temperature in the thimble tube is 652.4°F which is below the saturation temperature of 652.7°F.

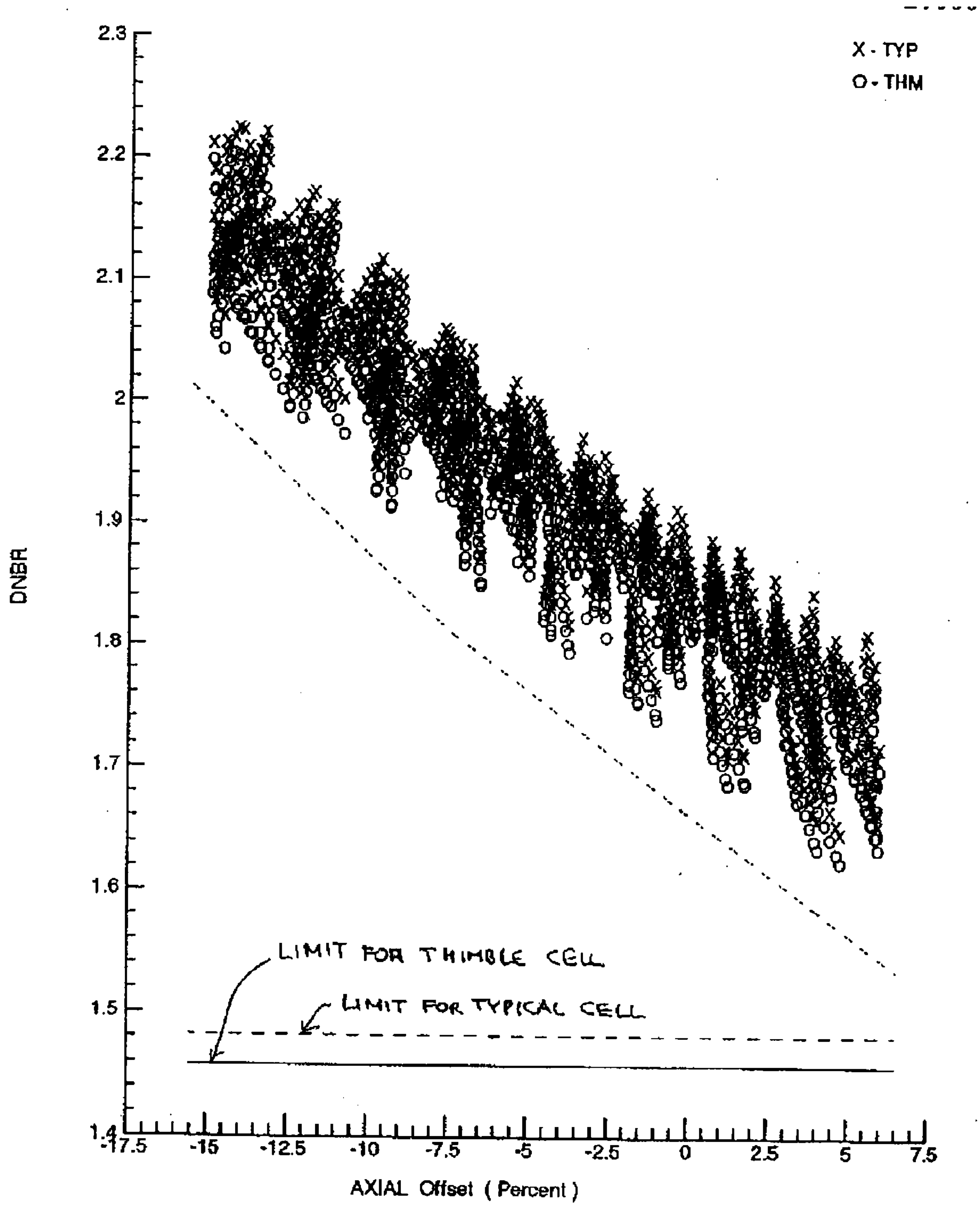

FIGURE 3.1
RESULTS OF ANALYSIS OF CONDITION I POWER SHAPES

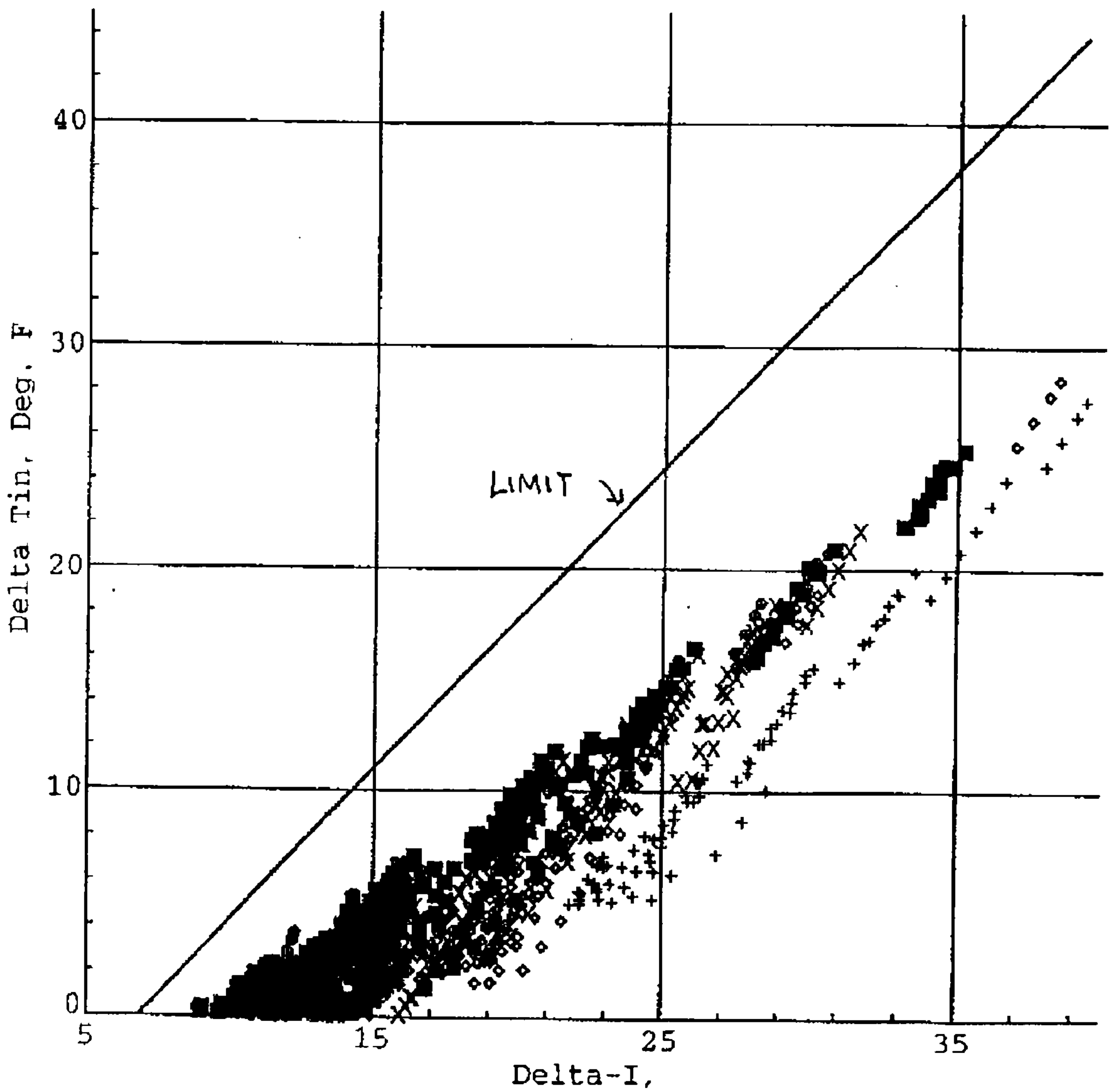

FIGURE 3.2A
RESULTS OF ANALYSIS OF CONDITION II POWER SHAPES

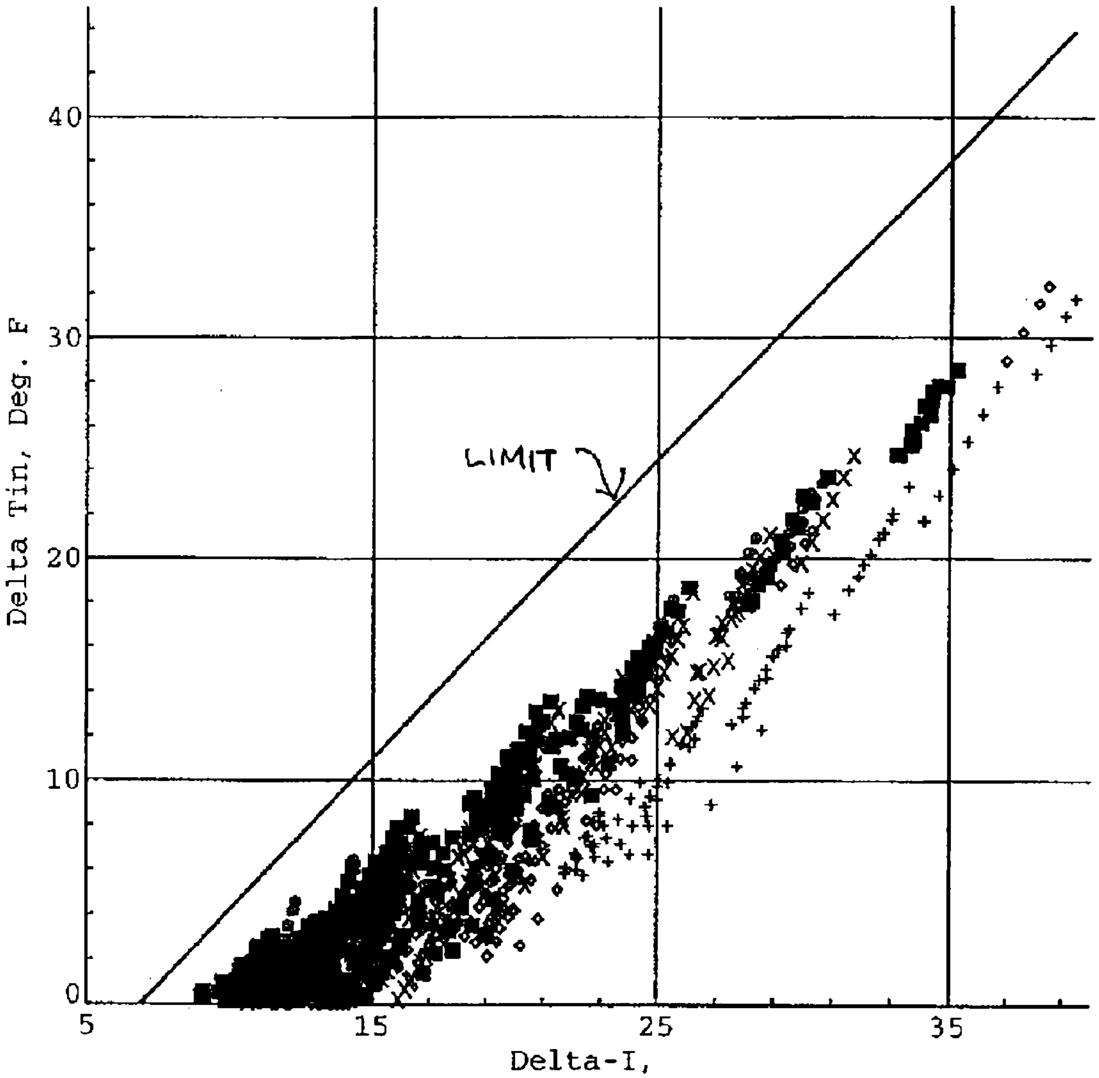

FIGURE 3.2B
RESULTS OF ANALYSIS OF CONDITION II POWER SHAPES