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

October 18, 1999

10 CFR 50.46(a)(3)(ii)

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

Gentlemen:

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

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - EMERGENCY CORE COOLING SYSTEM (ECCS) EVALUATION MODEL CHANGES - 30 DAY REPORT

The purpose of the letter is notify the NRC of changes or errors discovered in the WBN ECCS evaluation models for peak cladding temperature (PCT) in accordance with 10 CFR 50.46, and actions TVA has taken to address a change of more than 50°F in calculated PCT. This report includes model changes or errors since TVA's last report (Annual Notification Report for 1998), dated March 29, 1999, and is intended to satisfy both the 30-day and annual reporting requirements of 10 CFR 50.46. These changes to WBN's ECCS evaluation model affect the large break loss of coolant accident (LBLOCA) analysis and are described in Enclosure 1. The PCT margin allocations resulting from these changes are summarized in Enclosure 2.

This report identifies changes that affect PCT margin allocations for the LBLOCA, as reported to TVA by Westinghouse in letters dated March 26, 1999, and September 17, 1999. As indicated in Enclosure 2, the sum of the absolute values of the PCT margin allocations exceeds the threshold defined in 10 CFR 50.46(a)(3)(i) for a change of more than 50°F in calculated PCT. Therefore, TVA is reporting these changes within the 30-day time limit specified in 10 CFR 50.46. There have been no additional changes in the parts of the ECCS model that are used to analyze SBLOCA since WBN's last annual report.

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As discussed in Enclosure 1, the ECCS model errors and changes involve errors in the LOCBART Computer Code for the current 1981 BASH methodology for the large break LOCA analysis, a PCT penalty associated with accumulator line/pressurizer surge line design data, and a PCT penalty for a reanalysis using an increased cold leg accumulator water temperature.

The 1981 BASH Model uses the LOCBART code to calculate the thermal and hydraulic response of the hot assembly and hot rod to a postulated large break LOCA. The LOCBART errors affected calculations for Zirc-Water oxidation and the Spacer Grid Single-Phase Heat Transfer. Westinghouse notified the NRC of the Zirc-Water computer error in an Interim Report (98-029), pursuant to 10 CFR Part 21 on December 22, 1998, and provided updated status information to the staff on June 29, 1999. Their evaluation status determined that all affected plants were believed to be operating in a manner that would result in calculated ECCS performance which would satisfy 10 CFR 50.46 acceptance criteria noting that this conclusion may require taking credit for available plant specific peaking factor margins or cycle burnup effect. The WBN specific evaluation for this issue resulted in a limiting-case LOCBART reanalysis which modeled a reduction in F_Q from 2.5 to 2.4 and corrected the Spacer-Grid Single Phase Heat Transfer and Zirc-Water errors. This action resulted in a net PCT reduction of 18°F relative to the analysis of record result. This approach required TVA to restrict certain core operating limits, as depicted in Revision 1 to the WBN Core Operating Limits Report (COLR) for Unit 1, Cycle 3, submitted to the staff on September 20, 1999. Based on this resolution, the WBN Large Break LOCA ECCS Model for the current cycle satisfies the 10 CFR 50.46 acceptance criteria.

In accordance with 10 CFR 50.46(a)(3)(ii), TVA is required to provide a proposed schedule for providing a reanalysis or taking other actions needed to show compliance with 50.46 requirements for the changes or errors discussed above. Prior to the discovery of these issues, and as documented in TVA's license amendment request dated June 25, 1999, WBN Technical Specification Change No. WBN-TS-98-016, a large break LOCA reanalysis was completed for WBN based on the Westinghouse generic Best Estimate Large Break LOCA (BELOCA) analysis methodology using the WCOBRA/TRAC computer code in lieu of the 1981 BASH analysis. The NRC staff has approved this generic methodology in their Safety Evaluation Report dated June 28, 1996. As discussed in TVA's amendment request, the WBN-specific analysis (WCAP-14839, Revision 1) conforms to 10 CFR 50.46 and Section II of 10 CFR 50, Appendix-K.

The PCT results for the WBN BELOCA analysis are provided in Table 2 of TVA's June 25 letter, and yield a PCT for the large break LOCA of 1888°F, well below the 50.46 limit of 2200°F. The BELOCA analysis is not affected by the LOCBART calculation errors. As a result of corrective actions taken during the WBN Unit 1 Cycle 2 refueling outage to reduce accumulator room temperature, TVA does not anticipate any PCT penalty for the BELOCA analysis model for accumulator water temperature. The effect of the accumulator line/pressurizer line data errors on BELOCA is currently under evaluation by Westinghouse. This issue will be resolved through the licensing effort for WBN's proposed change to the Technical Specifications, WBN-TS-98-016. TVA has requested NRC staff review and approval of the WBN specific BELOCA analysis and the associated TS change in support of the Unit 1 Cycle 3 refueling outage, currently planned for September 2000.

Accordingly, TVA has completed the analysis required of 10 CFR 50.46 for changes or errors in an ECCS model and no further action is currently required.

If you should have any questions concerning this matter, please contact me at (423) 365-1824.

Sincerely,

P. L. Pace
Manager, Licensing and
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Enclosure
cc (Enclosure):

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ENCLOSURE 1

DESCRIPTION OF CHANGES WHICH AFFECT WBN'S EMERGENCY CORE COOLING SYSTEM EVALUATION MODEL AND ITS CALCULATION OF PEAK CLADDING TEMPERATURE

1. LOCBART SPACER GRID SINGLE-PHASE HEAT TRANSFER ERROR

Background

As discussed in WCAP-10484-P-A (Reference), the Yao-Hochreiter-Leech correlation is used in the LOCBART code to compute the single-phase heat transfer enhancement for axial elevations located downstream of spacer grids. The Safety Evaluation Report for WCAP-10484-P-A requires that a length-averaged value be used to specify the heat transfer coefficient for a given fluid cell, since use of a local value corresponding to the forward edge or the rear edge of the cell could be non-conservative. It was determined that the length-averaging in LOCBART was not being done correctly in all cases. This error correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model

1981 Westinghouse Large Break LOCA Evaluation Model with BASH

Estimated Effect

The effect of this error on existing results was determined on a plant-specific basis. The Large Break LOCA (LBLOCA) Peak Cladding Temperature (PCT) assessment for Watts Bar Unit 1 was determined collectively for the LOCBART Spacer Grid Single-Phase Heat-Transfer Error and the LOCBART Zirc-Water Oxidation Error (discussed below). A limiting-case LOCBART reanalysis modeled a reduction in F_Q from 2.5 to 2.4 and corrected the Spacer Grid Single-Phase Heat Transfer and Zirc-Water Oxidation Errors, resulting in a net PCT reduction of 18°F relative to the analysis-of-record result.

Reference

WCAP-10484-P-A, "Spacer Grid Heat Transfer Effects During Reflood", M.Y. Young et. al., March 1991.

2. LOCBART ZIRC-WATER OXIDATION ERROR

Background

As discussed in the Reference, a logic error in the LOCBART code caused the Baker-Just metal-water reaction calculations to be performed three times per timestep. Correcting the error was found to reduce the total cladding oxidation while increasing the heat deposition in the cladding. This error correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation- Models

1981 Westinghouse Large Break LOCA Evaluation Model with BASH

Estimated Effect

The effect of this error on existing results was determined on a plant-specific basis. The Large Break LOCA (LBLOCA) Peak Cladding Temperature (PCT) assessment for Watts Bar Unit 1 was determined collectively for the LOCBART Spacer Grid Single-Phase Heat-Transfer Error (discussed above)and the LOCBART Zirc-Water Oxidation Error. A limiting-case LOCBART reanalysis modeled a reduction in F_Q from 2.5 to 2.4 and corrected the Spacer Grid Single-Phase Heat Transfer and Zirc-Water Oxidation Errors, resulting in a net PCT reduction of 18°F relative to the analysis-of-record result.

Reference

NSD-NRC-99-5845, "Closure of Westinghouse Interim Report No. 98-029", H.A. Sepp, August 27, 1999.

3. ACCUMULATOR LINE/PRESSURIZER SURGE LINE DATA

Background

An issue was identified where the accumulator line piping schedule installed at a plant was different than the design value. This discovery led to a review of various geometric data related to the accumulator lines and pressurizer surge lines, and these revised data were compared to the LOCA analysis values to determine the effect on existing analysis results. For cases where erroneous data were identified, this issue was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Models

1981 Westinghouse Large Break LOCA Evaluation Model with BASH
1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP
1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model

Estimated Effect

For Small Break LOCA, the nature of this issue leads to an estimated PCT impact of 0°F. For Appendix K Large Break LOCA, the effect of this issue on existing results was determined on a plant-specific

basis. The Large Break LOCA (LBLOCA) Peak Cladding Temperature (PCT) assessment for Watts Bar Unit 1 was determined as follows: Various data related to the accumulator lines and pressurizer surge line for Watts Bar Unit 1 were recalculated by Westinghouse Fluid Systems and compared to the corresponding values from the LBLOCA analysis of record. All revised data were found to lie within established screening criteria except for the pressurizer surge line resistance and accumulator line resistances. For these parameters, PCT assessments of +16°F for pressurizer surge line resistance and +21°F for accumulator line resistance were estimated based on the results of sensitivity calculations for similar plants/transients, for a net increase of +37°F. For Best Estimate Large Break LOCA, the assessment of the affect on existing results is in progress.

4. ACCUMULATOR WATER TEMPERATURE INCREASE

Background

At the request of TVA, Westinghouse recently performed a LBLOCA BASH evaluation for Watts Bar Unit 1 to support an assumed maximum expected accumulator water temperature of 127°F based on updated plant-specific accumulator room temperature data. The accumulator water temperature that is currently assumed in the WBN LBLOCA analysis of record is 101°F and was derived from accumulator room temperature data available at the time of the original analysis and supports a maximum accumulator room temperature (maximum two week average) of 113°F. During the summer months of 1998, TVA determined that the average accumulator room temperature had exceeded the current analysis assumptions for accumulator room temperature of 113°F. The maximum daily average temperature of the hottest 3 accumulator rooms for 1998 was 125°F.

Affected Evaluation Models

1981 Westinghouse Large Break LOCA Evaluation Model with BASH

Estimated Effect

According to the BASH-EM method for determining the accumulator water temperature, it is appropriate to establish the BASH accumulator water temperature by subtracting 12°F from the maximum accumulator water temperature over the hottest two week period of a year. Conservatism beyond the standard Westinghouse methodology is provided in two ways: (1) The standard Westinghouse methodology calls for the maximum accumulator temperature to be determined over the hottest two week period and in this case 125°F was the maximum daily average, (2) The maximum daily average temperature shown in the accumulator room temperature data provided to Westinghouse is 125°F and the evaluation will be performed for 127°F.

Taking into consideration the maximum expected accumulator room temperature of 127°F and the guidance in place that allows 12°F to be subtracted from the maximum, a BASH accumulator temperature of 115°F

was assumed. As the current accumulator temperature assumed in the BASH analysis is 101°F, the delta between the currently analyzed temperature and the new assumption of maximum expected accumulator water temperature is 14°F. Applying the sensitivity of 1.3°F PCT/°F accumulator water temperature, an assessment of +19°F was applied.

As noted in TVA's June 25, 1999 letter, Proposed License Amendment for TS-98-016, corrective actions were taken during the Spring 1999 WBN Unit 1 Cycle 2 refueling outage to reduce the high accumulator room temperatures. These actions (i.e., insulated a large hot pipe routed through the accumulator room, adjusted leaking check valves, repaired a steam leak, etc.) appear to have been effective in reducing temperatures for the accumulator rooms. As a result, TVA does not anticipate any PCT penalty for the BELOCA analysis model due to elevated accumulator water temperatures. WBN continues to monitor the effectiveness of these corrective actions which are tracked in the corrective action program.

ENCLOSURE 2

SUMMARY OF PEAK CLADDING TEMPERATURE MARGIN ALLOCATIONS RESULTING FROM CHANGES TO THE EMERGENCY CORE COOLING SYSTEM EVALUATION MODEL

Westinghouse LOCA Peak Clad Temperature Summary For Large Break

Plant Name: Watts Bar Unit 1
Utility Name: Tennessee Valley Authority
Revision Date: 9/15/99

Analysis Information

EM:	BASH	**Analysis Date:**	04/97	**Limiting Break Size:**	Cd=0.6
FQ:	2.4	**FdH:**	1.6		
Fuel:	Vantage +	**SGTP (%):**	5		

Notes: Mixed Core - Vantage + / Performance +; FQ Reduced from 2.5 to 2.4

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	2111	1,2	
MARGIN ALLOCATIONS (Delta PCT)			
A. PRIOR PERMANENT ECCS MODEL ASSESSMENTS			
1. Total	0	3	
B. 10 CFR 50.59 SAFETY EVALUATIONS			
1. None	0		
C. 1999 10 CFR 50.46 MODEL ASSESSMENTS (Permanent Assessments of PCT Margin)			
1. LOCBART Spacer Grid Single-Phase Heat Transfer Error, LOCBART Zirc-Water Oxidation Error and Reanalysis of Limiting AOR Case	-18		(a)
2. Accumulator Line/Pressurizer Surge Line Data	37		
D. TEMPORARY ECCS MODEL ISSUES*			
1. None	0		
E. OTHER			
1. Increased Accumulator Water Temperature	19	3	
LICENSING BASIS PCT + MARGIN ALLOCATIONS	**PCT =**	2149	

* It is recommended that these temporary PCT allocations which address current LOCA model issues not be considered with respect to 10 CFR 50.46 reporting requirements.

References:

1. WAT-D-10337, "Tennessee Valley Authority Watts Bar Nuclear Plant, Final Safety Evaluation to Support Technical Specification Changes", March 5, 1997.
2. WAT-D-10356, "Tennessee Valley Authority Watts Bar Nuclear Plant Units 1 & 2, Final Report and Safety Evaluation for the 10% SGTP Program", June 2, 1997.
3. WAT-D-10641,"Tennessee Valley Authority Watts Bar Nuclear Plant: BASH Large Break LOCA Evaluation - Accumulator Water Temperature Increase," March 26, 1999.

Notes:

(a) This reanalysis modelled a reduction in FQ from 2.5 to 2.4 and addressed the LOCBART Spacer Grid Single-Phase Heat Transfer Error and LOCBART Zirc-Water Oxidation Error.