



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

October 26, 2000

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 AND ANNUAL
NOTIFICATION AND REPORTING FOR 2000

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 1999), dated October 18, 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 models affect both the best estimate large break loss of coolant accident (BELOCA) analysis and the small break LOCA (SBLOCA) 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 BELOCA as reported to TVA by Westinghouse Electric Company in letters dated February 23, 2000 (WAT-D-10725) and June 7, 2000 (WAT-D-10802), and for SBLOCA, as reported by Westinghouse in a letter dated June 30, 2000, (WAT-D-10810). At the time of the BELOCA report, the subject WBN Unit 1 BELOCA analysis was under review by NRC staff, and was not yet applicable as the code of record. The BELOCA analysis was approved for WBN Unit 1 by NRC on March 17, 2000, (TAC NO. M93767), as license Amendment No. 21, and was implemented for Unit 1 on September 27, 2000, upon return to operation following the Unit 1 Cycle 3 refueling outage. As indicated in Enclosure 2, the sum of the absolute values of the PCT margin allocations for BELOCA exceeds the threshold defined

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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. TVA notes that the resulting BELOCA PCT value of 1773°F was also reported to NRC in TVA's letter dated June 7, 2000, WBN Unit 1 - TS Change No. 00-06 - Increase Unit 1 Reactor Power to 3459 MWT, currently under staff review.

As discussed in Enclosure 1, the ECCS model errors and changes for BELOCA involve a PCT assessment resulting from an issue identified where the accumulator line piping schedule installed at a plant was different from 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. TVA's letter of October 18, 1999, discussed this issue and provided the resulting PCT impact for LBLOCA and SBLOCA, and noted that the effect of the accumulator line/pressurizer line data errors on BELOCA was being evaluated by Westinghouse. As discussed in WAT-D-10725, Westinghouse performed a plant specific sensitivity run to address increased accumulator line resistance based on data provided by TVA for WBN. As indicated in Enclosure 2, the resulting margin allocation for PCT was -131°F.

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. As a result of the accumulator line/pressurizer line data errors discussed above, the PCT results for the WBN BELOCA analysis yield a PCT for the large break LOCA of 1773°F. This value represents a reduction in the current NRC approved licensing basis PCT value of 1892°F and is well below the 10 CFR 50.46 limit of 2200°F. Based on this evaluation, the WBN Best Estimate Large Break LOCA ECCS Model for the current cycle satisfies and complies with the 10 CFR 50.46 acceptance criteria.

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.

TVA notes that Westinghouse letter WAT-D-10810 also provided PCT margin assessments for WBN's previous ECCS BASH model for LBLOCA. As the BASH model has been replaced by BELOCA and is no longer part of the WBN licensing basis, these assessments are not included in this report.

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

Sincerely,



P. L. Pace
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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(S) AND ITS CALCULATION OF PEAK CLADDING TEMPERATURE

1. 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

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, based on the following general characteristics of limiting small break transients: (1) only a small fraction of the available accumulator capacity is generally required to replenish vessel inventory to a level sufficient to terminate the cladding temperature excursion, and small variations in the rate of accumulator injection would be expected to have a minimal effect on results; and, (2) the pressurizer empties well before any core uncover occurs, so variations in the rate of pressurizer discharge would also be expected to have a minimal effect on results. Note that the preceding description expands upon the discussion of Estimated Effects for SBLOCA provided in TVA's letter dated October 18, 1999.

For Best Estimate Large Break LOCA, a plant specific sensitivity was run to address increased accumulator line resistance based on data provided to Westinghouse for WBN Unit 1. The PCT impact is included as a line item assessment on the margin utilization sheet (Enclosure 2). Note that the PCT Margin Allocation for BELOCA is the representative composite PCT sheet reflecting the most limiting PCT margin as determined from a composite of the early and late reflood conditions.

2. Increased Accumulator Temperature Range Evaluation and 1.4% Increase in Core Power - WBN Specific Evaluation

Background

The Current Licensing Basis BELOCA analysis employs a nominal core power of 3411 MWt and an accumulator temperature range of 110° to 120°F. At the request of TVA and in support of TVA's proposed WBN Unit 1 license amendment request for a 1.4% power uprate [TVA Letter June 7, 2000, TS-Change No. 00-06 (TAC NO. MA9152)], Westinghouse re-performed the analysis for an expanded accumulator temperature range of 100° to 130°F, and a 1.4% increase in core power to 3459 MWt.

Affected Evaluation Models

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model

Estimated Effect

The expanded accumulator temperature range was analyzed by using the WCOBRA/TRAC and the MONTEC computer codes. The PCT impact due to the range increase was a penalty of 4°F. The 1.4% uprate was evaluated for PCT impacts by use of the MONTEC computer code. The PCT impact due to the 1.4% uprate is a penalty of 12°F. These results were expected since an increase in the range of a variable (accumulator temperature) as well as an increase in power level is expected to increase the PCT; and due to the magnitude of the increases, the PCT impacts were expected to be small.

Note that the PCT Margin Allocation for BELOCA (Enclosure 2) is the representative composite PCT sheet reflecting the most limiting PCT margin as determined from a composite of the early and late reflood conditions.

3. NOTRUMP - Mixture Level Tracking/Region Depletion Errors

Background

Several closely related errors have been discovered in how NOTRUMP deals with the stack mixture level transition across a node boundary in a stack of fluid nodes. Firstly, when the mixture level attempts to transition a node boundary in a stack of fluid nodes, it can occasionally have difficulty crossing the interface (i.e. level hang). When a mixture level hang occurs at a node boundary, this leads to situations where the flow for a given time step is reset and becomes inconsistent with the matrix solution of the momentum equation for an excessive period of time. This results in local mass/energy errors being generated. In addition, it was discovered that the code was not properly updating metal node temperatures as a result of the implementation of the nodal region depletion logic which can be incurred when a fluid node empties or fills. It is noted that several aspects of these errors, namely mixture level

tracking and flow resets, are not directly tied to erroneous coding; rather, they are a direct result of modeling choices made and documented in the original code development/licensing. These errors affect all code versions up to and including NOTRUMP Version 37.0. These errors corrections were determined to contain both Discretionary and Non-Discretionary Change aspects in accordance with Sections 4.1.1 and 4.1.2 of WCAP-13451.

Affected Evaluation Model

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP.

Estimated Effect

The nature of this error leads to a bounding 13°F increase of the calculated PCT for all standard EM applications.

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 Best Estimate Large Break

Plant Name: Watts Bar Unit 1
Utility Name: Tennessee Valley Authority
Revision Date: 4/27/00

Analysis Information

EM: WCOBRA/TRAC **Analysis Date:** 08/98 **Limiting Break Size:** Guillotine
FQ: 2.5 **FdH:** 1.65
Fuel: Vantage + **SGTP (%):** 10
Notes: Mixed Core - Vantage + / Performance +

Composite

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	1892	1,2	
MARGIN ALLOCATIONS (Delta PCT)			
A. PRIOR PERMANENT ECCS MODEL ASSESSMENTS			
1 . Vessel Channel DX Error	-4	3	
B. 10 CFR 50.59 SAFETY EVALUATIONS			
1 . Accumulator Line/Pressurizer Surge Line Data Evaluation	-131	4	
2 . Increased Accumulator Temperature Range Evaluation	4		
3 . 1.4% Uprate Evaluation	12		
C. 2000 10 CFR 50.46 MODEL ASSESSMENTS (Permanent Assessments of PCT Margin)			
1 . None	0		
D. TEMPORARY ECCS MODEL ISSUES*			
1 . None	0		
E. OTHER			
1 . None	0		

LICENSING BASIS PCT + MARGIN ALLOCATIONS PCT = 1773

* 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 . WCAP-14839, Rev. 1, "Best Estimate Analysis of the Large Break Loss of Coolant Accident for the Watts Bar Nuclear Plant," August 1998.
- 2 . WAT-D-10499, "Tennessee Valley Authority Watts Bar Nuclear Plant Units 1 and 2, 10 CFR 50.46 Annual Notification and Reporting for 1997," February 27, 1998.
- 3 . WAT-D-10618, "Tennessee Valley Authority, Watts Bar Nuclear Plant Units 1 and 2, 10 CFR 50.46 Annual Notification and Reporting for 1998," March 5, 1999.
- 4 . WAT-D-10725, "Tennessee Valley Authority, Watts Bar Nuclear Plant Unit 1, 10 CFR 50.46 Annual Notification and Reporting for 1999," February 23, 2000.

Notes:

None

Westinghouse LOCA Peak Clad Temperature Summary For Small Break

Plant Name: Watts Bar Unit 1
Utility Name: Tennessee Valley Authority
Revision Date: 6/21/00

Analysis Information

EM: NOTRUMP **Analysis Date:** 11/96 **Limiting Break Size:** 4 inch
FQ: 2.5 **FdH:** 1.65
Fuel: Vantage + **SGTP (%):** 10
Notes: Mixed Core - Vantage + / Performance +

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	1126	1,2	
MARGIN ALLOCATIONS (Delta PCT)			
A. PRIOR PERMANENT ECCS MODEL ASSESSMENTS			
1 . None	0	3	
B. 10 CFR 50.59 SAFETY EVALUATIONS			
1 . Annular Blankets	10	3	(a)
C. 2000 10 CFR 50.46 MODEL ASSESSMENTS (Permanent Assessments of PCT Margin)			
1 . NOTRUMP Mixture Level Tracking / Region Depletion Errors	13		
D. TEMPORARY ECCS MODEL ISSUES*			
1 . None	0		
E. OTHER			
1 . Tav _g Uncertainty of 6 °F	1		

LICENSING BASIS PCT + MARGIN ALLOCATIONS PCT = 1150

* 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-10618, "Tennessee Valley Authority, Watts Bar Nuclear Plant Units 1 and 2, 10 CFR 50.46 Annual Notification and Reporting for 1998," March 5, 1999.

Notes:

- (a) This penalty applies beginning with Cycle 3.