



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

APR 19 2005

10 CFR 50.46

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

In the Matter of the)
Tennessee Valley Authority)

Docket No. 50-390

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - EMERGENCY CORE COOLING SYSTEM (ECCS) EVALUATION MODEL CHANGES - ANNUAL NOTIFICATION AND REPORTING FOR 2004

Reference:

1. TVA letter to NRC dated April 19, 2004, "WBN Unit 1 - Emergency Core Cooling System (ECCS) Evaluation Model Changes - 30 Day Report and Revised Annual Notification and Reporting for 2003"

This letter provides information that fulfils the annual reporting requirements of 10 CFR 50.46. The enclosed information addresses changes or errors in the WBN ECCS evaluation model that affect the calculation of peak cladding temperature (PCT). WBN's ECCS evaluation model is contractually maintained by Westinghouse Electric Corporation and the last 10 CFR 50.46 report for WBN was submitted in a letter dated April 19, 2004. The changes to the model that have been made since that time are described in Enclosure 1 and are based on information provided by Westinghouse in a letter dated April 6, 2005.

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The PCT margin allocations resulting from the changes listed in Enclosure 1 are summarized in Enclosure 2. The PCT change since the submittal of the 2003 report (referenced above) is listed below:

LOCA PCT Summary for Best Estimate Large Break	2003 Report	2004 Report	Change in PCT
Composite	1785°F	1790°F	5°F
Reflood 1	1763°F	1768°F	5°F
Reflood 2	1785°F	1790°F	5°F
LOCA PCT Summary for Small Break	1185°F	1185°F	0°F

There are no regulatory commitments in this letter. Should there be questions regarding the information provided in this letter, please call me at (423) 365-1824.

Sincerely,



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

Enclosures

1. Description of Changes which affect WBN's Emergency Core Cooling System Evaluation Model(s) and its Calculation of Peak Cladding Temperature
2. Summary of Peak Cladding Temperature Margin Allocations Resulting from Changes to the Emergency Core Cooling System Evaluation Model

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Enclosures

cc (Enclosures):

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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. REVISED BLOWDOWN HEATUP UNCERTAINTY DISTRIBUTION

Background:

Correction of modeling inconsistencies and input errors in the LOFT input decks have resulted in a change in the predicted peak cladding temperature transients. Revised analyses of the LOFT and ORNL tests were performed using the current version of WCOBRA/TRAC. As a result of this re-analysis, revised blowdown heatup heat transfer coefficients were developed and the revised cumulative distribution function (CDF) was programmed into a new version of HOTSPOT. The revised CDF was previously reported to the NRC in LTR-NRC-04-11. The overall code uncertainty for blowdown was also recalculated and programmed into a new version of MONTECF. The overall code uncertainty for reflood was not affected. These corrections were determined to be Non-Discretionary changes in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Models:

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model.
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model,
Application to PWRs with Upper Plenum Injection.
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using
ASTRUM.

Estimated Effect:

An estimate of the PCT effect of the revised blowdown heatup CDF was performed for the 1996 and 1999 Evaluation Models by calculating the impact on the reference transient for representative 2-, 3- and 4-loop plants. The estimates bound all of the 95th percentile HOTSPOT results. Estimates of the effect of the revised overall code uncertainty for blowdown were made on a plant-specific basis by repeating the MONTECF analysis, for those plants that track the blowdown period.

The revised blowdown heatup heat transfer multipliers have been and will be used for all analyses based on the 2004 ASTRUM Evaluation Model. Therefore, no PCT assessments are necessary for those plants.

2. GENERAL CODE MAINTENANCE (NOTRUMP)

Background:

Various changes in code input and output format have been made to enhance usability and help preclude errors in analyses. This includes both input changes (e.g., more relevant input variables defined and more common input values used as defaults) and input diagnostics designed to preclude unreasonable values from being used, as well as various changes to code output which have no effect on calculated results. In addition, various updates were made to eliminate inactive coding, improve active coding, and enhance commenting, both for enhanced usability and to facilitate code debugging when necessary. These changes represent Discretionary Changes that will be implemented on a forward-fit basis in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Models:

1981 Westinghouse Large Break LOCA Evaluation Model with BASH.
1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP.

Estimated Effect:

The nature of these changes leads to an estimated PCT impact of 0° F.

3. IMPLEMENTATION OF ASTRUM CAPABILITY IN HOTSPOT

Background:

The HOTSPOT code was modified to be compatible with the Automated Statistical Treatment of Uncertainty Methodology (ASTRUM, described in WCAP-16009-P-A). An option is used to trigger the ASTRUM HOTSPOT technique (single iteration mode) or the Monte Carlo mode used in the previous Best Estimate Large Break LOCA evaluation models. These changes were considered to be Discretionary changes in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Models:

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model.
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model, Application to PWRs with Upper Plenum Injection.

Estimated Effect:

None of these changes affect the results of design basis analyses performed with these evaluation models. Therefore, the estimated effect is zero.

4. GENERAL CODE MAINTENANCE (WC/T)

Background:

A number of coding changes were made as part of normal code maintenance. Examples include correction of debug plots not used in design analyses, and improved consistency between the HOTSPOT nominal PCT (not used in the uncertainty analysis) and WCOBRA/TRAC PCT. All of these changes are considered to be Discretionary changes in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Models:

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model.
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model, Application to PWRs with Upper Plenum Injection.
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM.

Estimated Effect:

None of these changes affect the results of design basis analyses. Therefore, the estimated effect is zero.

5. IMPROVED AUTOMATION OF END OF BLOWDOWN TIME

Background:

Heat transfer multipliers are considered in the uncertainty methodology as a function of the time period in the transient. The blowdown cooling heat transfer multipliers are applied during the time period following turnaround of the blowdown heatup through the end of blowdown. For simplicity, the end of blowdown was originally defined as the time when the system pressure dropped below 40 psia. In cases where the pressure did not drop below 40 psia, the analyst would manually redefine the end of blowdown

based on the time of minimum system pressure. The automated selection of the end of blowdown time was improved by replacing the 40 psia criterion with a selection based on the time at which the system pressure stops decreasing. All of these changes are considered to be Discretionary changes in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Models:

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model,
Application to PWRs with Upper Plenum Injection
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using
ASTRUM

Estimated Effect:

The correct end of blowdown time was selected in all prior analyses. Therefore, the estimated effect is zero.

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 /4 /05

Composite

Analysis Information

EM: WCOBRA/TRAC **Analysis Date:** 8/1/98 **Limiting Break Size:** Guillotine
FQ: 2.5 **FdII:** 1.65
Fuel: Vantage + **SGTP (%):** 10
Notes: Mixed Core - Vantage + / Performance + / RFA-2

	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	
2 . MONTECF Decay Heat Uncertainty Error	4	6	
3 . Input Error Resulting in Incomplete Solution Matrix	0	7	
4 . Tavq Bias Error	8	7	
B. PLANNED PLANT CHANGE EVALUATIONS			
1 . Accumulator Line/Pressurizer Surge Line Data Evaluation	-131	4	
2 . Increased Accumulator Temperature Range Evaluation	4	5	
3 . 1.4% Uprate Evaluation	12	5	
4 . Increased Stroke Time for the ECCS Valves	0	9	
C. 2004 PERMANENT ECCS MODEL ASSESSMENTS			
1 . Revised Blowdown Heatup Uncertainty Distribution	5	8	
D. TEMPORARY ECCS MODEL ISSUES*			
1 . None	0		
E. OTHER			
1 . None	0		

LICENSING BASIS PCT + MARGIN ALLOCATIONS PCT = 1790

* 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.

Attachment 2 – PCT Sheets
Our ref: WAT-D-11334
April 6, 2005

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 /4 /05

Composite

- 5 . WAT-D-10840, "Tennessee Valley Authority, Watts Bar Nuclear Plant Unit 1, Final Deliverables for 1.4% Uprate Program," August 31, 2000.
- 6 . WAT-D-10904, "10 CFR 50.46 Annual Notification and Reporting for 2000," February 2001.
- 7 . WAT-D-11225, "10 CFR 50.46 Annual Notification and Reporting for 2003," March 2004.
- 8 . WAT-D-11334, "10 CFR 50.46 Annual Notification and Reporting for 2004," March 2005.
- 9 . WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.

Notes:

None

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 /4 /05

Reflood 1

Analysis Information

EM: WCOBRA/TRAC Analysis Date: 8/1/98 Limiting Break Size: Guillotine
 FQ: 2.5 FdH: 1.65
 Fuel: Vantage + SGTP (%): 10
 Notes: Mixed Core - Vantage + / Performance + / RFA-2

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	1656	1,2	
MARGIN ALLOCATIONS (Delta PCT)			
A. PRIOR PERMANENT ECCS MODEL ASSESSMENTS			
1 . Vessel Channel DX Error	56	3	
2 . MONTECF Decay Heat Uncertainty Error	4	5	
3 . Input Error Resulting in Incomplete Solution Matrix	60	6	
4 . Tavg Bias Error	8	6	
B. PLANNED PLANT CHANGE EVALUATIONS			
1 . Accumulator Line/Pressurizer Surge Line Data Evaluation	-37	4	
2 . Increased Accumulator Temperature Range Evaluation	4	4	
3 . 1.4% Uprate Evaluation	12	4	
4 . Increased Stroke Time for the ECCS Valves	0	8	
C. 2004 PERMANENT ECCS MODEL ASSESSMENTS			
1 . Revised Blowdown Heatup Uncertainty Distribution	5	7	
D. TEMPORARY ECCS MODEL ISSUES*			
1 . None	0		
E. OTHER			
1 . None	0		

LICENSING BASIS PCT + MARGIN ALLOCATIONS PCT = 1768

* 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-10840, "Tennessee Valley Authority, Watts Bar Nuclear Plant Unit 1, Final Deliverables for 1.4% Uprate Program," August 31, 2000.

Attachment 2 – PCT Sheets
Our ref: WAT-D-11334
April 6, 2005

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 /4 /05

Reflood 1

- 5 . WAT-D-10904, "10 CFR 50.46 Annual Notification and Reporting for 2000," February 2001.
- 6 . WAT-D-11225, "10 CFR 50.46 Annual Notification and Reporting for 2003," March 2004.
- 7 . WAT-D-11334, "10 CFR 50.46 Annual Notification and Reporting for 2004," March 2005.
- 8 . WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.

Notes:

None

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 /4 /05

Reflood 2

Analysis Information

EM: WCOBRA/TRAC Analysis Date: 8/1/98 Limiting Break Size: Guillotine
 FQ: 2.5 FdH: 1.65
 Fuel: Vantage + SGTP (%): 10
 Notes: Mixed Core - Vantage + / Performance + / RFA-2

	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	
2 . MONTECF Decay Heat Uncertainty Error	4	6	
3 . Input Error Resulting in Incomplete Solution Matrix	0	7	
4 . Tavg Bias Error	8	7	
B. PLANNED PLANT CHANGE EVALUATIONS			
1 . Accumulator Line/Pressurizer Surge Line Data Evaluation	-131	4	
2 . Increased Accumulator Temperature Range Evaluation	4	5	
3 . 1.4% Uprate Evaluation	12	5	
4 . Increased Stroke Time for the ECCS Valves	0	9	
C. 2004 PERMANENT ECCS MODEL ASSESSMENTS			
1 . Revised Blowdown Heatup Uncertainty Distribution	5	8	
D. TEMPORARY ECCS MODEL ISSUES*			
1 . None	0		
E. OTHER			
1 . None	0		
LICENSING BASIS PCT + MARGIN ALLOCATIONS	PCT =	1790	

* 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.

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 /4 /05

Reflood 2

- 5 . WAT-D-10840, "Tennessee Valley Authority, Watts Bar Nuclear Plant Unit 1, Final Deliverables for 1.4% Upgrade Program," August 31, 2000.
- 6 . WAT-D-10904, "10 CFR 50.46 Annual Notification and Reporting for 2000," February 2001.
- 7 . WAT-D-11225, "10 CFR 50.46 Annual Notification and Reporting for 2003," March 2004.
- 8 . WAT-D-11334, "10 CFR 50.46 Annual Notification and Reporting for 2004," March 2005.
- 9 . WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.

Notes:

None

Westinghouse LOCA Peak Clad Temperature Summary for Small Break

Plant Name: Watts Bar Unit 1
Utility Name: Tennessee Valley Authority
Revision Date: 4 /4 /05

Analysis Information

EM: NOTRUMP **Analysis Date:** 11/1/96 **Limiting Break Size:** 4 inch
FQ: 2.5 **FdH:** 1.65
Fuel: Vantage + **SGTP (%):** 10
Notes: Mixed Core - Vantage + / Performance + / RFA-2

	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 . NOTRUMP Mixture Level Tracking / Region Depletion Errors	13	4	
2 . NOTRUMP Bubble Rise / Drift Flux Model Inconsistency Corrections	35	5	
B. PLANNED PLANT CHANGE EVALUATIONS			
1 . Annular Blankets	10	3	
2 . Increased Stroke Time for the ECCS Valves	0	6	
C. 2004 PERMANENT ECCS MODEL ASSESSMENTS			
1 . None	0		
D. TEMPORARY ECCS MODEL ISSUES*			
1 . None	0		
E. OTHER			
1 . Tav _g Uncertainty of 6 °F	1		

LICENSING BASIS PCT + MARGIN ALLOCATIONS **PCT = 1185**

* 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 Unit 1, 10 CFR 50.46 Annual Notification and Reporting for 1998," March 5, 1999.
- 4 . WAT-D-10810, "Tennessee Valley Authority, Watts Bar Nuclear Plant Unit 1, 10 CFR 50.46 Appendix K (BART/BASH/NOTRUMP) Evaluation Model Mid-Year Notification and Reporting for 2000," June 30, 2000.
- 5 . WAT-D-11195, "10 CFR 50.46 Mid-Year Notification and Reporting for 2003," November 2003.
- 6 . WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.

Notes:

None