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**R. M. Krich**  
Vice President  
Nuclear Licensing

April 27, 2011

10 CFR 50.4  
10 CFR 50.46

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

Watts Bar Nuclear Plant, Unit 1  
Facility Operating License No. NPF-90  
NRC Docket No. 50-390

**Subject: 10 CFR 50.46 Annual Report for Model Year 2010**

**Reference:** TVA Letter to NRC, "10 CFR 50.46 Annual Report for Model Year 2009,"  
dated December 21, 2010

The purpose of this letter is to provide the annual report of changes or errors discovered in the emergency core cooling system evaluation model for Watts Bar Nuclear Plant, Unit 1. In accordance with 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems (ECCS) for Light-Water Nuclear Power Reactors," paragraph (a)(3)(ii), the enclosed report describes the nature and the estimated effect on the limiting ECCS analysis of changes or errors discovered since submittal of the reference letter.

There are no regulatory commitments in this letter. Please direct questions concerning this issue to Robert Clark, Senior Licensing Engineer, at (423) 365-1818.

Respectfully,

R. M. Krich

Enclosure: 10 CFR 50.46 Annual Report

cc (Enclosure):

NRC Regional Administrator – Region II  
NRC Senior Resident Inspector – Watts Bar Nuclear Plant

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**WATTS BAR NUCLEAR PLANT  
UNIT 1**

**10 CFR 50.46 ANNUAL REPORT**

**1. URANIA-GADOLINIA PELLET THERMAL CONDUCTIVITY CALCULATION**

**Background**

Two errors were discovered in the pellet thermal conductivity calculation for urania-gadolinia pellets in the SBLOCTA code. First, the calculation did not include the terms required to adjust for pellet densities other than 95% of the theoretical density. Second, the conversion from Fahrenheit to Rankine used an adder of 459 instead of 459.67. These errors have been corrected and evaluated for impact on existing Small Break Loss of Coolant Accident (LOCA) analysis results. These changes represent a closely-related group of Non-Discretionary Changes in accordance with Section 4.1.2 of WCAP-13451.

**Affected Evaluation Model(s)**

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

**Estimated Effect**

SBLOCTA sensitivity calculations led to an estimated peak cladding temperature (PCT) effect of 0°F for existing Small Break LOCA analysis results.

**2. PELLET CRACK AND DISH VOLUME CALCULATION**

**Background**

Two errors were discovered in the calculation of the normalized pellet crack and dish volumes in the SBLOCTA code. First, an incorrect operator was used to select between two tables of normalized volume vs. linear heat generation rate. Second, the normalized volume at 18 kW/ft was incorrectly programmed in one of the tables as 1.58 instead of 1.59. These errors have been corrected in the SBLOCTA code and will be corrected (where applicable) in future versions of the BASH and LOCBART codes. These changes represent a closely-related group of Non-Discretionary Changes in accordance with Section 4.1.2 of WCAP-13451.

**Affected Evaluation Model(s)**

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

**Estimated Effect**

A combination of SBLOCTA sensitivity calculations and engineering judgment led to an estimated PCT effect of 0°F for existing Large and Small Break LOCA analysis results.

### **3. TREATMENT OF VESSEL AVERAGE TEMPERATURE UNCERTAINTY**

#### **Background**

Historically, the overall vessel average temperature uncertainty calculated by Westinghouse considered only “-” instrument uncertainties, corresponding to the indicated temperature being lower than the actual temperature. This uncertainty was then applied as a “+/-” uncertainty in some LOCA analyses, rather than using specific “+” and “-” uncertainties. This discrepancy has been evaluated for impact on existing Large and Small Break LOCA analysis results, and its resolution represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

#### **Affected Evaluation Model(s)**

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP  
1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model  
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model, Application to Pressurized Water Reactors with Upper Plenum Injection  
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

#### **Estimated Effect**

This issue was judged to have a negligible impact on existing Large and Small Break LOCA analysis results, leading to an estimated PCT impact of 0°F.

### **4. GENERAL CODE MAINTENANCE**

#### **Background**

Various changes have been made to enhance the usability of the codes and to help preclude errors in analyses. This includes items such as modifying input variable definitions, units, and defaults; improving the input diagnostic checks; enhancing the code output; optimizing active coding; and, eliminating inactive coding. 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 Model(s)**

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.

**5. WAT CYCLE 10 NORMALIZED POWER INTEGRAL IN MIDDLE 1/3 CORE (PMID) VIOLATION**

**Background**

The Watts Bar, Unit 1, Cycle 10 reload core design resulted in several violations of the PMID limit used in the Large Break LOCA analysis. These violations were evaluated for Watts Bar, Unit 1, Cycle 10 operation. This change represents a Discretionary Change in accordance with Section 4.1.1 of WCAP-13451.

**Affected Evaluation Model(s)**

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model

**Estimated Effect**

The impact of the PMID violation for Watts Bar Unit 1 Cycle 10 was determined via a plant-specific evaluation to be 20°F for Reflood 1 and Reflood 2.

**6. WATTS BAR, UNIT 1, ASYMMETRIC ACCUMULATOR WATER TEMPERATURE INCREASE TO 150°F FOR ONE ACCUMULATOR**

**Background**

During Unit 1, Cycle 10 the air temperature in accumulator room number 2 exceeded the maximum evaluated temperature of 130°F for Large Break and Small Break LOCA. TVA requested an evaluation to allow the affected accumulator to operate at a maximum water temperature of 150°F. This change represents a Discretionary Change in accordance with Section 4.1.1 of WCAP-13451 and resulted in an 8°F PCT penalty. The elevated room temperature was due to temporary interruption of cooling water flow to two motor coolers mounted on RCP-2. Cooling was interrupted to the motor coolers to determine the location of unidentified leakage in lower containment. Integral vanes mounted on each end of the rotor are used to draw air through cooling slots in the motor frame and then discharge it to external air-to-water heat exchangers (coolers). In passing through the coolers, the air is cooled below 123°F so that minimum heat is rejected into lower containment. The PCT penalty only apply during the time cooling water was interrupted to the motor coolers. After troubleshooting was completed, cooling water was re-established and the affected accumulator room temperature returned to normal. TVA notified Westinghouse by letter that this penalty is no longer applicable (see Reference 3).

**Affected Evaluation Model(s)**

None

**Estimated Effect**

Large and Small Break LOCA:

None

**7. 10 CFR 50.46 REPORT FOR THE WATTS BAR, UNIT 1, INTERMEDIATE HEAD SAFETY INJECTION (IHSI) FLOW REDUCTION SMALL BREAK LOCA EVALUATION**

**Background**

An evaluation, documented in Reference 1, was performed to determine the effect of reduced Emergency Core Cooling System (ECCS) IHSI flows on the Watts Bar, Unit 1, Small Break LOCA analysis of record documented in Reference 2.

**Affected Evaluation Model(s)**

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

**Estimated Effect**

The reduced ECCS IHSI flows evaluated in Reference 1 have no effect on the Small Break LOCA PCT for Watts Bar, Unit 1.

**8. LEAKING SAFETY INJECTION (SI) RELIEF VALVE**

The PCT penalty of 120°F due to the leaking SI Relief Valve in the 4-inch SI pump discharge header was due to pockets of gas that accumulated in the discharge header. When the pumps started the pressure surges caused the header relief valve to lift and then subsequently leak. Design Change Notice (DCN) 52257 was implemented to add vent valves in three locations to allow periodic venting to remove accumulated gas. DCN 52257 was implemented during the Unit 1 Cycle 8 Refueling Outage. This modification corrected the spurious relief valve lifts and the resulting valve leakage. TVA notified Westinghouse by letter that this penalty is no longer applicable (see Reference 3).

**Affected Evaluation Model(s)**

None

**Estimated Effect**

Large and Small Break LOCA:

None

**9. REFERENCES**

1. WAT-D-11859, "Revised ECCS Flow Impact on Small Break LOCA," January 2011.
2. WCAP-16286-P, Revision 2, "Watts Bar Unit 1 Replacement Steam Generator Program NSSS Engineering Report," June 2006.
3. TVA's Letter to Westinghouse, "Watts Bar Nuclear Plant (WBN) Unit 1 - 10 CFR 50.46 Annual Peak Clad Temperature Report - Conditions Returned to Normal since Previous Report," March 3, 2011.

**Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break**

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority  
**Revision Date:** 1/14/2011

**Cycle 9, RSG  
 Composite**

**Analysis Information**

**EM:** CQD (1996)      **Analysis Date:** 8/1/1998      **Limiting Break Size:** Guillotine  
**FQ:** 2.5              **FdH:** 1.65  
**Fuel:** Vantage +      **SGTP (%):** 12  
**Notes:** Mixed Core - Vantage + / Performance + / RFA-2

	Clad Temp (°F)	Ref.	Notes
<b>LICENSING BASIS</b>			
<b>Analysis-Of-Record PCT</b>	1892	1, 2	

**PCT ASSESSMENTS (Delta PCT)**

<b>A. PRIOR ECCS MODEL ASSESSMENTS</b>			
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	
5. Revised Blowdown Heatup Uncertainty Distribution	5	8	
6. HOTSPOT Fuel Relocation Error	65	11	
7. Accumulator Line/Pressurizer Surge Line Data Evaluation	-131	4	
<b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b>			
1. Increased Accumulator Temperature Range Evaluation	4	5	
2. 1.4% Uprate Evaluation	12	5	
3. Increased Stroke Time for the ECCS Valves	0	9	
4. Replacement Steam Generators (D3 to 68AXP)	-10	10	
5. PMID Violation Evaluation	20	12	
<b>C. 2010 ECCS MODEL ASSESSMENTS</b>			
1. None	0		
<b>D. OTHER</b>			
1. None	0		

**LICENSING BASIS PCT + PCT ASSESSMENTS                      PCT = 1865**

**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.

**Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break**

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority

**Cycle 9, RSG  
Composite**

**Revision Date:** 1/14/2011

**References (Continued):**

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.
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," April 2005.
9. WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.
10. WTV-RSG-06-015, "LOCA & Non-LOCA Analysis Summary for Replacement Steam Generator," February 2006.
11. LTR-LIS-07-378, "10 CFR 50.46 Reporting Text for HOTSPOT Fuel Relocation Error and Revised PCT Rackup Sheets for Watts Bar Unit 1," June 2007.
12. LTR-LIS-07-893, "10 CFR 50.46 Reporting Text for Watts Bar Unit 1 Cycle 9 RSAC PMID Violation Evaluation and Revised PCT Rackup Sheets," December 2007.

**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:** 1/14/2011

# Cycle 9, RSG Reflood 1

**Analysis Information**

**EM:** CQD (1996)      **Analysis Date:** 8/1/1998  
**FQ:** 2.5              **FdH:** 1.65  
**Fuel:** Vantage +      **SGTP (%):** 12  
**Notes:** Mixed Core - Vantage + / Performance + / RFA-2

**Limiting Break Size:** Guillotine

**LICENSING BASIS**

**Analysis-Of-Record PCT**

Clad Temp (°F)	Ref.	Notes
1656	1, 2	

**PCT ASSESSMENTS (Delta PCT)**

**A. PRIOR ECCS MODEL ASSESSMENTS**

1. Vessel Channel DX Error	56	3
2. MONTECF Decay Heat Uncertainty Error	4	6
3. Input Error Resulting in Incomplete Solution Matrix	60	7
4. Tavg Bias Error	8	7
5. Revised Blowdown Heatup Uncertainty Distribution	5	8
6. HOTSPOT Fuel Relocation Error	0	11
7. Accumulator Line/Pressurizer Surge Line Data Evaluation	-37	4

**B. PLANNED PLANT MODIFICATION EVALUATIONS**

1. Increased Accumulator Temperature Range Evaluation	4	5
2. 1.4% Uprate Evaluation	12	5
3. Increased Stroke Time for the ECCS Valves	0	9
4. Replacement Steam Generators (D3 to 68AXP)	-50	10
5. PMID Violation Evaluation	20	12

**C. 2010 ECCS MODEL ASSESSMENTS**

1. None	0	
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**D. OTHER**

1. None	0	
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**LICENSING BASIS PCT + PCT ASSESSMENTS**

**PCT = 1738**

**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.



## Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority

# Cycle 9, RSG Reflood 1

**Revision Date:** 1/14/2011

### References (Continued):

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.
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," April 2005.
9. WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.
10. WTV-RSG-06-015, "LOCA & Non-LOCA Analysis Summary for Replacement Steam Generator," February 2006.
11. LTR-LIS-07-378, "10 CFR 50.46 Reporting Text for HOTSPOT Fuel Relocation Error and Revised PCT Rackup Sheets for Watts Bar Unit 1," June 2007.
12. LTR-LIS-07-893, "10 CFR 50.46 Reporting Text for Watts Bar Unit 1 Cycle 9 RSAC PMID Violation Evaluation and Revised PCT Rackup Sheets," December 2007.

### 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:** 1/14/2011

**Cycle 9, RSG  
 Reflood 2**

**Analysis Information**

**EM:** CQD (1996)      **Analysis Date:** 8/1/1998  
**FQ:** 2.5              **FdH:** 1.65  
**Fuel:** Vantage +      **SGTP (%):** 12  
**Notes:** Mixed Core - Vantage + / Performance + / RFA-2

**Limiting Break Size:** Guillotine

	Clad Temp (°F)	Ref.	Notes
<b>LICENSING BASIS</b>			
<b>Analysis-Of-Record PCT</b>	1892	1, 2	
<b>PCT ASSESSMENTS (Delta PCT)</b>			
<b>A. PRIOR ECCS MODEL ASSESSMENTS</b>			
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	
5. Revised Blowdown Heatup Uncertainty Distribution	5	8	
6. HOTSPOT Fuel Relocation Error	65	11	
7. Accumulator Line/Pressurizer Surge Line Data Evaluation	-131	4	
<b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b>			
1. Increased Accumulator Temperature Range Evaluation	4	5	
2. 1.4% Uprate Evaluation	12	5	
3. Increased Stroke Time for the ECCS Valves	0	9	
4. Replacement Steam Generators (D3 to 68AXP)	-10	10	
5. PMID Violation Evaluation	20	12	
<b>C. 2010 ECCS MODEL ASSESSMENTS</b>			
1. None	0		
<b>D. OTHER</b>			
1. None	0		
<b>LICENSING BASIS PCT + PCT ASSESSMENTS</b>	<b>PCT = 1865</b>		

**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.

**Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break**

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority

**Cycle 9, RSG  
Reflood 2**

**Revision Date:** 1/14/2011

**References (Continued):**

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.
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," April 2005.
9. WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.
10. WTV-RSG-06-015, "LOCA & Non-LOCA Analysis Summary for Replacement Steam Generator," February 2006.
11. LTR-LIS-07-378, "10 CFR 50.46 Reporting Text for HOTSPOT Fuel Relocation Error and Revised PCT Rackup Sheets for Watts Bar Unit 1," June 2007.
12. LTR-LIS-07-893, "10 CFR 50.46 Reporting Text for Watts Bar Unit 1 Cycle 9 RSAC PMID Violation E Valuation and Revised PCT Rackup Sheets," December 2007.

**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:** 1/14/2011

# Cycle 10, RSG Composite

**Analysis Information**

**EM:** CQD (1996)      **Analysis Date:** 8/1/1998      **Limiting Break Size:** Guillotine  
**FQ:** 2.5              **FdH:** 1.65  
**Fuel:** Vantage +      **SGTP (%):** 12

**Notes:** Mixed Core - Vantage+ / Performance+ / RFA-2

	Clad Temp (°F)	Ref.	Notes
<b>LICENSING BASIS</b>			
<b>Analysis-Of-Record PCT</b>		1892	1, 2

**PCT ASSESSMENTS (Delta PCT)**

**A. PRIOR 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
5. Revised Blowdown Heatup Uncertainty Distribution	5	8
6. HOTSPOT Fuel Relocation Error	65	11
7. Accumulator Line/Pressurizer Surge Line Data Evaluation	-131	4

**B. PLANNED PLANT MODIFICATION EVALUATIONS**

1. Increased Accumulator Temperature Range Evaluation	4	5
2. 1.4% Uprate Evaluation	12	5
3. Increased Stroke Time for the ECCS Valves	0	9
4. Replacement Steam Generators (D3 to 68AXP)	-10	10
5. PMID Violation Evaluation	20	12
6. One Accumulator Increased Maximum Temperature to 150°F	8	13

**C. 2010 ECCS MODEL ASSESSMENTS**

1. None	0	
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**D. OTHER**

1. None	0	
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**LICENSING BASIS PCT + PCT ASSESSMENTS**                      **PCT = 1873**

**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.

**Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break**

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority

# **Cycle 10, RSG Composite**

**Revision Date:** 1/14/2011

**References (Continued):**

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.
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," April 2005.
9. WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.
10. WTV-RSG-06-015, "LOCA & Non-LOCA Analysis Summary for Replacement Steam Generator," February 2006.
11. LTR-LIS-07-378, "10 CFR 50.46 Reporting Text for HOTSPOT Fuel Relocation Error and Revised PCT Rackup Sheets for Watts Bar Unit 1," June 2007.
12. LTR-LIS-10-118, "10 CFR 50.46 Reporting Text for Watts Bar Unit 1 Cycle 10 RSAC PMID Violation Evaluation and Revised PCT Rackup Sheets," February 2010.
13. LTR-LIS-10-397, "10 CFR 50.46 Report for the Watts Bar Unit 1 Asymmetric Increase in Water Temperature to 150°F for One Accumulator," July 2010.

**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:** 1/14/2011

# Cycle 10, RSG

## Reflood 1

**Analysis Information**

**EM:** CQD (1996)      **Analysis Date:** 8/1/1998  
**FQ:** 2.5              **FdH:** 1.65  
**Fuel:** Vantage +      **SGTP (%):** 12  
**Notes:** Mixed Core - Vantage + / Performance + / RFA-2

**Limiting Break Size:** Guillotine

	Clad Temp (°F)	Ref.	Notes
<b>LICENSING BASIS</b>			
<b>Analysis-Of-Record PCT</b>	1656		1, 2
<b>PCT ASSESSMENTS (Delta PCT)</b>			
<b>A. PRIOR ECCS MODEL ASSESSMENTS</b>			
1. Vessel Channel DX Error	56	3	
2. MONTECF Decay Heat Uncertainty Error	4	6	
3. Input Error Resulting in Incomplete Solution Matrix	60	7	
4. Tavg Bias Error	8	7	
5. Revised Blowdown Heatup Uncertainty Distribution	5	8	
6. HOTSPOT Fuel Relocation Error	0	11	
7. Accumulator Line/Pressurizer Surge Line Data Evaluation	-37	4	
<b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b>			
1. Increased Accumulator Temperature Range Evaluation	4	5	
2. 1.4% Uprate Evaluation	12	5	
3. Increased Stroke Time for the ECCS Valves	0	9	
4. Replacement Steam Generators (D3 to 68AXP)	-50	10	
5. PMID Violation Evaluation	20	12	
6. One Accumulator Increased Maximum Temperature to 150°F	8	13	
<b>C. 2010 ECCS MODEL ASSESSMENTS</b>			
1. None	0		
<b>D. OTHER</b>			
1. None	0		
<b>LICENSING BASIS PCT + PCT ASSESSMENTS</b>	<b>PCT = 1746</b>		

**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.

## Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority

# Cycle 10, RSG Reflood 1

**Revision Date:** 1/14/2011

### References (Continued):

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.
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," April 2005.
9. WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.
10. WTV-RSG-06-015, "LOCA & Non-LOCA Analysis Summary for Replacement Steam Generator," February 2006.
11. LTR-LIS-07-378, "10 CFR 50.46 Reporting Text for HOTSPOT Fuel Relocation Error and Revised PCT Rackup Sheets for Watts Bar Unit 1," June 2007.
12. LTR-LIS-10-118, "10 CFR 50.46 Reporting Text for Watts Bar Unit 1 Cycle 10 RSAC PMID Violation Evaluation and Revised PCT Rackup Sheets," February 2010.
13. LTR-LIS-10-397, "10 CFR 50.46 Report for the Watts Bar Unit 1 Asymmetric Increase in Water Temperature to 150°F for One Accumulator," July 2010.

### Notes:

None

**Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break**

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority

# Cycle 10, RSG

**Revision Date:** 1/14/2011

## Reflow 2

**Analysis Information**

**EM:** CQD (1996)      **Analysis Date:** 8/1/1998  
**FQ:** 2.5              **FdH:** 1.65  
**Fuel:** Vantage +      **SGTP (%):** 12  
**Notes:** Mixed Core - Vantage + / Performance + / RFA-2

**Limiting Break Size:** Guillotine

	Clad Temp (°F)	Ref.	Notes
<b>LICENSING BASIS</b>			
<b>Analysis-Of-Record PCT</b>	1892		1, 2

**PCT ASSESSMENTS (Delta PCT)**

**A. PRIOR 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
5. Revised Blowdown Heatup Uncertainty Distribution	5	8
6. HOTSPOT Fuel Relocation Error	65	11
7. Accumulator Line/Pressurizer Surge Line Data Evaluation	-131	4

**B. PLANNED PLANT MODIFICATION EVALUATIONS**

1. Increased Accumulator Temperature Range Evaluation	4	5
2. 1.4% Uprate Evaluation	12	5
3. Increased Stroke Time for the ECCS Valves	0	9
4. Replacement Steam Generators (D3 to 68AXP)	-10	10
5. PMID Violation Evaluation	20	12
6. One Accumulator Increased Maximum Temperature to 150°F	8	13

**C. 2010 ECCS MODEL ASSESSMENTS**

1. None	0
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**D. OTHER**

1. None	0
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**LICENSING BASIS PCT + PCT ASSESSMENTS**                      **PCT = 1873**

**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.



**Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break**

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority

# **Cycle 10, RSG**

## **Reflood 2**

**Revision Date:** 1/14/2011

**References (Continued):**

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.
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," April 2005.
9. WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.
10. WTV-RSG-06-015, "LOCA & Non-LOCA Analysis Summary for Replacement Steam Generator," February 2006.
11. LTR-LIS-07-378, "10 CFR 50.46 Reporting Text for HOTSPOT Fuel Relocation Error and Revised PCT Rackup Sheets for Watts Bar Unit 1," June 2007.
12. LTR-LIS-10-118, "10 CFR 50.46 Reporting Text for Watts Bar Unit 1 Cycle 10 RSAC PMID Violation Evaluation and Revised PCT Rackup Sheets," February 2010.
13. LTR-LIS-10-397, "10 CFR 50.46 Report for the Watts Bar Unit 1 Asymmetric Increase in Water Temperature to 150°F for One Accumulator," July 2010.

**Notes:**

None

**Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Small Break**

**RSG**

**Plant Name:** Watts Bar Unit 1  
**Utility Name:** Tennessee Valley Authority

**Revision Date:** 1/27/2011

**Analysis Information**

**EM:** NOTRUMP      **Analysis Date:** 5/17/2004      **Limiting Break Size:** 4 inch  
**FQ:** 2.5      **FdH:** 1.65  
**Fuel:** RFA-2      **SGTP (%):** 12  
**Notes:** Mixed Core - Vantage + / Performance + / RFA-2

	<b>Clad Temp (°F)</b>	<b>Ref.</b>	<b>Notes</b>
<b>LICENSING BASIS</b>			
<b>Analysis-Of-Record PCT</b>	1132	1	
<b>PCT ASSESSMENTS (Delta PCT)</b>			
<b>A. PRIOR ECCS MODEL ASSESSMENTS</b>			
1. None	0		
<b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b>			
1. Increased Stroke Time for the ECCS Valves	0	2	
<b>C. 2010 ECCS MODEL ASSESSMENTS</b>			
1. One Accumulator Increased Maximum Temperature to 150°F	0	4	
<b>D. OTHER</b>			
1. Leaking SIS Relief Valve	120	3	
<b>LICENSING BASIS PCT + PCT ASSESSMENTS</b>	<b>PCT = 1252</b>		

**References:**

1. WTV-RSG-06-015, "LOCA & Non-LOCA Analysis Summary for Replacement Steam Generator," February 2006.
2. WAT-D-11285, "Evaluation of Proposed Changes to the Stroke Time for the ECCS Valves," November 2004.
3. WAT-D-11360, "Safety Injection Pump Discharge Relief Valve Leakage Evaluation," July 2005.
4. LTR-LIS-10-397, "10 CFR 50.46 Report for the Watts Bar Unit 1 Asymmetric Increase in Water Temperature to 150°F for One Accumulator," July 2010.

**Notes:**

None