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Our ref: LTR-NRC-10-75

January 10, 2011

**U. S. Nuclear Regulatory Commission  
10 CFR 50.46 Annual Notification and Reporting for 2009**

Dear Mr. Ulses,

The purpose of this letter is to report the impact of changes or errors in the emergency core cooling system (ECCS) evaluation models used by Westinghouse Electric Company. A description of the changes to the Westinghouse small-break LOCA and large-break LOCA ECCS evaluation models for 2009 is provided as an attachment. Westinghouse has categorized these changes or errors into two separate groups:

- Non-Discretionary Changes
- Discretionary Changes

This annual notification is being provided since it affects information previously submitted in Westinghouse topical reports. It is noted that plant-specific peak cladding temperature (PCT) variations are not addressed in this letter. These should be treated, as appropriate, on a plant-specific basis in accordance with the applicable sections of 10 CFR 50. Westinghouse has notified licensees utilizing these Westinghouse ECCS evaluation models in their plant licensing basis of the appropriate reportable changes.

For future referencing convenience, the 2009 10 CFR 50.46 reportable changes provided in the attachment, together with the "2008 Formulation" offered in Reference 2 constitutes the "2009 Formulation" of the Westinghouse ECCS evaluation models.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. A. Gresham'.

J. A. Gresham, Manager  
Regulatory Compliance and Plant Licensing Engineering

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January 10, 2011

**References:**

1. ET-NRC-92-3755, "W Methodology for Implementation of 10 CFR 50.46 Reporting," N. J. Liparulo, Westinghouse to NRC Document Control Desk, October 30, 1992. (WCAP-13451)
2. LTR-NRC-09-17, "U.S. Nuclear Regulatory Commission, 10 CFR 50.46 Annual Notification and Reporting for 2008," J. A. Gresham, March 31, 2009.

**Attachment:**

1. Standard Format Text for Changes and Enhancements to the Westinghouse Evaluation Models for 2009 (10 pages, including cover page)

## **Attachment**

# **Standard Format Text for Changes and Enhancements to the Westinghouse Evaluation Models for 2009**

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**Discretionary Changes**

General Code Maintenance  
Evaluation of Revised Vessel Leakages

**Non-Discretionary Changes**

Upper Plenum Wetted Perimeter Overprediction  
Error in ASTRUM Processing of Average Rod Burnup and Rod Internal Pressure  
Discrepancy in Metal Masses Used from Drawings  
HOTSPOT Gap Heat Transfer Logic  
HOTSPOT Statistical Output Logic  
Evaluation of Revised Bypass Hole Flow Coefficients

**GENERAL CODE MAINTENANCE  
(Discretionary Change)**

**Background**

Various changes have been made to enhance the usability of codes and to streamline future analyses. Examples of these changes include 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)**

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

## **EVALUATION OF REVISED VESSEL LEAKAGES (Discretionary Change)**

### **Background**

Vessel leakages in Dresden and Quad Cities were found to differ from those used initially in LOCA evaluations of these plants. The revised vessel leakages have been evaluated for impact on licensing-basis PCT and, where not already implemented, will be incorporated into the cycle-specific reload analyses on a forward-fit basis. This change represents an ECCS model assessment and is considered a Discretionary Change in accordance with Section 4.1.1 of WCAP-13451.

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

Westinghouse BWR LOCA Evaluation Model

### **Estimated Effect**

The impact of the revised vessel leakages for Dresden Units 2 and 3 and Quad Cities Units 1 and 2 was assessed on the analysis results, leading to an estimated PCT impact of 2°F.

**UPPER PLENUM WETTED PERIMETER OVERPREDICTION  
(Non-Discretionary Change)**

**Background**

The open hole wetted perimeter above the peripheral assemblies was incorrectly accounted for in a plant's BELOCA vessel model. The net impact of this change is an over-estimation of the outer global channel wetted perimeter at several elevations at the top of the upper plenum. An evaluation of the impact was performed on the current licensing-basis analysis results. This change represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

**Affected Evaluation Model(s)**

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

**Estimated Effect**

This error was evaluated to have a negligible impact on the Large Break LOCA analysis results, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.

**ERROR IN ASTRUM PROCESSING OF AVERAGE ROD BURNUP AND ROD INTERNAL PRESSURE**  
**(Non-Discretionary Change)**

**Background**

An error was discovered in the processing of the burnup and rod internal pressure inputs for average core rods in ASTRUM analyses. The correction of this error has been evaluated for impact on current licensing-basis analyses and will be incorporated into the ASTRUM method at a future time. 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)**

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

**Estimated Effect**

This error was evaluated to have a negligible impact on PCT, leading to an estimated impact of 0°F for 10 CFR 50.46 reporting purposes.



**DISCREPANCY IN METAL MASSES USED FROM DRAWINGS  
(Non-Discretionary Change)**

**Background**

Discrepancies were discovered in the use of lower support plate (LSP) metal masses from drawings. The updated LSP metal masses have been evaluated for impact on current licensing-basis analysis results and will be incorporated on a forward-fit basis. This change represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

**Affected Evaluation Model(s)**

SECY UPI WCOBRA/TRAC Large Break LOCA Evaluation Model  
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**

For some analyses the lower support plate mass error is relatively minor and would be expected to have a negligible effect on the Large Break LOCA analysis results, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.

For other analyses sensitivity studies were performed using a representative WCOBRA/TRAC model in which the correct LSP mass was used. It was determined that the effect of the error correction on the peak cladding temperature was negligible, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.

## **HOTSPOT GAP HEAT TRANSFER LOGIC (Non-Discretionary Change)**

### **Background**

The HOTSPOT code has been updated to incorporate the following changes to the gap heat transfer logic: (1) change the gap temperature from the pellet average temperature to the average of the pellet outer surface and cladding inner surface temperatures; (2) correct the calculation of the pellet surface emissivity to use a temperature in °R (as specified in Equation 7-28 of Reference 1) instead of °F; and (3) revise the calculation of the gap radiation heat transfer coefficient to delete a term and temperature adder not shown in or suggested by Equation 7-28 of Reference 1. 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)**

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**

Sample calculations showed a minimal impact on PCT, leading to an estimated effect of 0°F.

### **Reference(s)**

1. WCAP-12945-P-A, Volume 1, Revision 2, "Code Qualification Document for Best Estimate LOCA Analysis, Volume I: Models and Correlations," March 1998.

## **HOTSPOT STATISTICAL OUTPUT LOGIC (Non-Discretionary Change)**

### **Background**

The HOTSPOT code has been updated to incorporate the following changes to the statistical output logic for calculations using the Code Qualification Document methodology: (1) revise one of the three methods for calculating the standard deviation of cladding temperature to correctly identify the bin containing the 97.5<sup>th</sup> percentile value; and (2) change the 50<sup>th</sup>, 95<sup>th</sup> and 97.5<sup>th</sup> percentile bin values from the lower end of the range to the upper end. 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)**

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**

Sample calculations suggested a minimal impact on the 95<sup>th</sup> percentile PCT, leading to an estimated effect of 0°F.

**EVALUATION OF REVISED BYPASS HOLE FLOW COEFFICIENTS  
(Non-Discretionary Change)**

**Background**

Bypass hole flow coefficients for Dresden Units 2 and 3 and Quad Cities Units 1 and 2 were evaluated after an inconsistency with the current Westinghouse calculation method was discovered. The flow coefficients were correctly implemented for the fresh bundles in the Dresden Unit 2 Cycle 22 core. The revised flow coefficients for the other Units have been evaluated for impact on licensing-basis PCT and will be incorporated into the cycle-specific reload analyses on a forward-fit basis. This change represents an ECCS model assessment and is considered a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

**Affected Evaluation Model(s)**

Westinghouse BWR LOCA Evaluation Model

**Estimated Effect**

The impact of the revised bypass hole flow coefficients for the Dresden and Quad Cities Units was evaluated on the analysis results, leading to plant-specific PCT assessments.