WOLF CREEK
NUCLEAR OPERATING CORPORATION

Cynthia R. Hafenstine
Manager Regulatory Affairs

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RA 18-0023

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

Reference: Westinghouse Letter LTR-LIS-18-39, dated February 15, 2018, "Wolf Creek 10 CFR 50.46 Annual Notification and Reporting for 2017"

Subject: Docket No. 50-482: 10 CFR 50.46 Annual Report of Emergency Core Cooling System (ECCS) Evaluation Model Changes

To Whom It May Concern:

In accordance with 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," paragraph (a)(3)(ii), Wolf Creek Nuclear Operating Corporation (WCNOC) is submitting the attached information to fulfill the annual reporting requirement for the Wolf Creek Generating Station (WCGS).

WCNOC has reviewed the above Reference, which addresses 10 CFR 50.46 reporting information pertaining to the Emergency Core Cooling System (ECCS) Evaluation Model changes that were implemented by Westinghouse for 2017. The review concludes that the effect of changes to, or errors in, the Evaluation Models on the limiting transient peak cladding temperature (PCT) is not significant for 2017. Therefore, changes to the ECCS Evaluation Models are being reported as an annual report.

Attachment I provides an assessment of the specific changes and enhancements to the Westinghouse Evaluation Models for 2017. These model changes and enhancements do not have impacts on the PCT and, generally, will not be presented on the PCT rack-up forms.

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Attachment II provides PCT rack-up forms for the calculated Large Break Loss-of-Coolant Accident (LOCA) and Small Break LOCA PCT margin allocations in effect for the 2017 WCGS Evaluation Models. The PCT values determined in the Large Break and Small Break LOCA analyses of record, combined with all of the PCT allocations, remain below the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F. Therefore, WCGS is in compliance with 10 CFR 50.46 requirements and no reanalysis or other action is required.

This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4204 or Bill Muilenburg at (620) 364-4186.

Sincerely,

Cynthia R. Hafenstine

Cynthia R. Hafenstine

CRH/rlt

Attachments: I Assessment of Changes to the Westinghouse Emergency Core Cooling System (ECCS) Evaluation Models for Large and Small Break Loss-of-Coolant Accidents (LOCA)

II Emergency Core Cooling System (ECCS) Evaluation Model Peak Cladding Temperature (PCT) Margin Utilization Rack-up Forms

cc: K. M. Kennedy (NRC), w/a
B. K. Singal (NRC), w/a
N. H. Taylor (NRC), w/a
Senior Resident Inspector (NRC), w/a

ASSESSMENT OF CHANGES TO THE WESTINGHOUSE EMERGENCY CORE COOLING SYSTEM (ECCS) EVALUATION MODELS FOR LARGE AND SMALL BREAK LOSS-OF-COOLANT ACCIDENTS (LOCA)

GENERAL CODE MAINTENANCE

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)

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM
1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

The nature of these changes leads to an estimated Peak Cladding Temperature (PCT) impact of 0°F.

ERROR IN THE UPPER PLENUM FLUID VOLUME CALCULATION

Background

An error was found in the fluid volume calculation in the upper plenum where the support column outer diameter was being used instead of the inner diameter. The correction of this error lead to a reduction in the upper plenum fluid volume used in the Appendix K Large Break LOCA and Small Break LOCA analyses. The corrected values represent a less than 1% change in the total RCS fluid volume and will be incorporated on a forward-fit basis, based on the evaluated impact on the current licensing basis analysis results. These changes represent 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

Estimated Effect

The differences in the upper plenum fluid volume are relatively minor and have been evaluated to have a negligible effect on large and small break LOCA analysis results, leading to an estimated PCT impact of 0°F.

INCONSISTENT APPLICATION OF NUMERICAL RAMP APPLIED TO THE ENTRAINED LIQUID / VAPOR INTERFACIAL DRAG COEFFICIENT

Background

A numerical ramp which was used to account for the disappearance of the entrained liquid phase was applied to the entrained liquid/vapor interfacial drag coefficient. The numerical ramp was applied such that the interfacial drag coefficient used in the solution of the entrained liquid and vapor momentum equations was not consistent. WCOBRA/TRAC was updated to apply the numerical ramp prior to usage of the interfacial drag coefficient in the momentum equations, such that a consistent interfacial drag coefficient was used in the entrained liquid and vapor momentum equations.
This item 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

Based on the code validation results, the impact of correcting the error is estimated to have a 0°F impact on PCT.

INAPPROPRIATE RESETTING OF TRANSVERSE LIQUID MASS FLOW

Background

In the WCOBRA/TRAC routine which evaluates the mass and energy residual error of the time step solution, the transverse liquid mass flow is reset as the liquid phase disappears. The routine is updated to remove the resetting of the transverse liquid mass flow since the routine is to only evaluate the residual error based on the time step solution values.
This item 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

Based on the code validation results and limited applicability of the logic removed, correcting the error is estimated to have a 0°F impact on PCT.

STEADY-STATE FUEL TEMPERATURE CALIBRATION METHOD

Background

In the Automated Statistical Treatment of Uncertainty Method (ASTRUM) Best-Estimate (BE) Large-Break Loss-of-Coolant Accident (LBLOCA) Evaluation Model (EM), the steady-state fuel pellet temperature calibration method involves solving for the hot gap width (AGFACT) to calibrate the fuel temperature for each fuel rod. In some infrequent situations, small non-conservatisms can occur in the calibration process such that the resulting fuel pellet temperature will be slightly lower than intended and outside the acceptable range defined by Table 12-6 of WCAP-16009-P/NP-A [1].
This issue has been evaluated to estimate the impact on ASTRUM BE LBLOCA analysis results. The resolution of this issue 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

A review of licensing basis analyses concluded that the potential non-conservatisms in the fuel pellet temperature calibration did not occur for the limiting analysis cases. Therefore, an estimated PCT impact of 0°F is assigned for 10 CFR 50.46 reporting purposes.

Reference(s)

1) WCAP-16009-P/NP-A, “Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Of Uncertainty Method (ASTRUM),” January 2005.

EMERGENCY CORE COOLING SYSTEM (ECCS) EVALUATION MODEL PEAK CLADDING TEMPERATURE (PCT) MARGIN UTILIZATION RACK-UP FORMS

*** LARGE BREAK LOCA PCT MARGIN UTILIZATION ***

Evaluation Model:	ASTRUM (2004)
Fuel:	RFA-2
Peaking Factor:	FQ=2.50, FdH=1.65
SG Tube Plugging:	10%
Power Level:	3565 MWth
Limiting Break Size:	DEG

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis of Record (AOR) PCT	1900	1	
MARGIN ALLOCATIONS (ΔPCT)			
A. PRIOR PERMANENT ECCS MODEL ASSESSMENTS			
1. Containment Fan Cooler Capacity	0	2	
2. Decay Group Uncertainty Factors Errors	-10	3	
B. PLANNED PLANT CHANGE EVALUATIONS			
1. Containment Fan Cooler Capacity	0	2	(a)
C. 2017 PERMANENT ECCS MODEL ASSESSMENTS			
1. None	0		
D. OTHER			
1. None	0		

LICENSING BASIS PCT + MARGIN ALLOCATIONS **PCT = 1890 °F**

CUMULATIVE ABSOLUTE MAGNITUDE OF PCT CHANGES SINCE LAST 30-DAY REPORT (LETTER RA 15-0080) $\Sigma|\Delta PCT| = 0$ **°F**

References:

1. WCAP-17107-P, Revision 1, "Best-Estimate Analysis of the Large-Break Loss-of-Coolant Accident for the Wolf Creek Nuclear Power Plant Using the ASTRUM Methodology," January 2014.
2. LTR-LIS-14-400, "10 CFR 50.46 Report for the Wolf Creek Large Break LOCA Evaluation of the Change in Containment Cooling Capacity," August 2014.
3. LTR-LIS-14-492, "Wolf Creek Unit 1 10 CFR 50.46 Report for the Correction of the Decay Group Uncertainty Factors Errors," November 2014.

Notes:

(a) This effect was estimated based on a cooling capacity intended to bound future implementation of replacement tube bundles in the containment fan coolers.

*** SMALL BREAK LOCA PCT MARGIN UTILIZATION ***

Evaluation Model:	1985 EM with NOTRUMP
Fuel:	17x17 RFA-2 w/IFM
Peaking Factor:	FQ=2.50, FdH=1.65
SG Tube Plugging:	10%
Power Level:	3565 MWth
Limiting transient:	4-inch Break

LICENSING BASIS

	Clad Temp (°F)	Ref.	Notes
Analysis of Record PCT	936	1	
MARGIN ALLOCATIONS (ΔPCT)			
A. PRIOR PERMANENT ECCS MODEL ASSESSMENTS			
1. None	0		
B. PLANNED PLANT CHANGE EVALUATIONS			
1. Loose Part Evaluation	45	2	(a)
C. 2017 PERMANENT ECCS MODEL ASSESSMENTS			
1. None	0		
D. TEMPORARY ECCS MODEL ISSUES			
1. None	0		
E. OTHER			
1. None	0		

LICENSING BASIS PCT + MARGIN ALLOCATIONS **PCT = 981 °F**

CUMULATIVE ABSOLUTE MAGNITUDE OF PCT CHANGES **$\Sigma|\Delta PCT|$ = 0 °F**

References:

1. WCAP-16717-P, Rev. 0, "Wolf Creek Generating Station (SAP), MSIV/MFIV Replacement Project, Small Break Loss of Coolant Accident Analysis Engineering Report," January 2007.

2. SAP-90-148/NS-OPLS-OPL-I-90-239, "Wolf Creek Nuclear Operating Corporation, RCS Loose Part Evaluation," April 1990.

Notes:

(a) This penalty will be carried to track the loose part which has not been recovered.