WOLF CREEK
NUCLEAR OPERATING CORPORATION

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Manager Regulatory Affairs

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RA 17-0022

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

Reference: Westinghouse Letter LTR-LIS-17-56, dated February 8, 2017, "Wolf Creek 10 CFR 50.46 Annual Notification and Reporting for 2016"

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 2016. 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 2016. 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 2016. 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 2016 WCGS Evaluation Models. The PCT values determined in the Large Break and Small Break LOCA analysis 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

Attachment 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

Estimated Effect

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

ERROR IN OXIDATION CALCULATIONS

Background

A closely-related group of errors were discovered in the WCOBRA/TRAC software program. The errors are related to the calculation of high temperature oxidation within a realistic large break LOCA calculation. This issue has been evaluated to estimate the impact on the Automated Statistical Treatment of Uncertainty Method (ASTRUM) and the Best-Estimate (BE) Large Break Loss-of-Coolant Accident (LBLOCA) licensing-basis 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

It was determined that correcting the high temperature oxidation calculation in WCOBRA/TRAC is estimated to have a negligible impact on the BE LBLOCA peak cladding temperature (PCT) analysis results, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.

ERROR IN USE OF ASME STEAM TABLES

Background

The American Society of Mechanical Engineers (ASME) steam tables are used to calculate the steady-state upper head liquid temperature as a function of the pressure and specific enthalpy in the ASTRUM software program. The steam table applicable to steam/gas is used to determine the upper head fluid temperature. However, the water in the upper head is in the subcooled liquid state during normal operation (and the steady-state calculation). Therefore, the steam table applicable to liquid should be used to determine the upper head fluid temperature. This issue has been evaluated to estimate the impact on Automated Statistical Treatment of Uncertainty Method (ASTRUM) Best-Estimate (BE) Large Break Loss-of-Coolant Accident (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

It was determined that the temperatures calculated by the ASME steam tables applicable to the steam/gas side and the liquid side are very similar within the typical upper head pressure and liquid specific enthalpy ranges. Therefore, this error was evaluated to have a negligible impact on the ASTRUM BE LBLOCA analysis results, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.

EVALUATION OF THE EFFECT OF A REDUCTION IN THERMAL DESIGN FLOW

Background

The Wolf Creek Unit 1 thermal design flow (TDF) was originally analyzed at 90,324 gpm/loop in the BE LBLOCA and small break LOCA (SBLOCA) analyses of record (AORs). During the methodology transition project, the TDF was reduced to 90,300 gpm/loop per Performance Capability Working Group (PCWG) methodology. An evaluation has been completed to estimate the effect of the reduction in TDF on the BE LBLOCA and SBLOCA transient results. This change represents a Discretionary Change 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

A qualitative evaluation was completed concluding that the slight reduction of the thermal design flow for the BE LBLOCA and SBLOCA AORs will have a negligible effect on the calculated PCT. Therefore, this change is estimated to have a PCT impact of 0°F.

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

LICENSING BASIS

	Clad Temp (°F)	Ref.	Notes
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. 2016 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. 2016 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.