

WOLF CREEK NUCLEAR OPERATING CORPORATION

Richard A. Muench
Vice President Technical Services

MAR 20 2002

ET 02-0016

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

Reference: Westinghouse Letter SAP-02-6, dated March 4, 2002, Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station Unit 1, 10 CFR 50.46 Annual Notification and Reporting for 2001

Subject: Docket No. 50-482: 10 CFR 50.46 Annual Report of ECCS Model Changes

Gentlemen:

This letter provides the annual report for the Emergency Core Cooling System (ECCS) Evaluation Model changes and errors for the 2001 model year that affect the Peak Cladding Temperature (PCT) for the Wolf Creek Generating Station (WCGS). This letter is provided in accordance with the criteria and reporting requirements of 10 CFR 50.46(a)(3)(ii), as clarified in Section 5.1 of WCAP-13451, "Westinghouse Methodology for Implementation of 10 CFR 50.46 Reporting." Regulation 10 CFR 50.46(a)(3)(ii) states, in part, "For each change to or error discovered in an acceptable evaluation model or in the application of such a model that affects the temperature calculation, the applicant or licensee shall report the nature of the change or error and its estimated effect on the limiting ECCS analysis to the Commission at least annually as specified in section 50.4. If the change or error is significant, the applicant or licensee shall provide this report within 30 days and include with the report a proposed schedule for providing a reanalysis or taking other action as may be needed to show compliance with section 50.46 requirements."

Wolf Creek Nuclear Operating Corporation (WCNOC) has reviewed the notification of 10 CFR 50.46 reporting information pertaining to the ECCS Evaluation Model changes that were implemented by Westinghouse for 2001 as described in the above Reference. The review concludes that the effect of changes to, or errors in, the Evaluation Models on the limiting transient PCT is not significant for 2001. Therefore, the report of the ECCS Evaluation Model changes is provided on an annual basis.

Attachment I provides an assessment of the specific changes and enhancements to the Westinghouse Evaluation Models for 2001. These model changes and enhancements do not have impacts on the PCT and will generally not be presented on the PCT rack-up forms.

Attachment II provides the calculated Large Break Loss of Coolant Accident (LOCA) and Small Break LOCA PCT margin allocations in effect for the 2001 WCGS evaluation models. There were no changes made for 2001 that impact the PCT effect for 10 CFR 50.46 reporting purposes. The PCT values determined in the Small Break and Large Break LOCA analysis of record, combined with all of the PCT allocations, remain well below the 10 CFR 50.46 regulatory limit of 2200 degrees Fahrenheit. Therefore, WCGS is in compliance with 10 CFR 50.46 requirements and no reanalysis or other action is required.

No commitments are identified in this correspondence.

If you have any questions concerning this matter, please contact me at (620) 364-4034, or Mr. Tony Harris at (620) 364-4038.

Very truly yours,



Richard A. Muench

RAM/pb

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)

Attachment II – Emergency Core Cooling System (ECCS) Evaluation Model Peak Cladding Temperature (PCT) Margin Allocations

cc: J. N. Donohew (NRC), w/a
D. N. Graves (NRC), w/a
E. W. Merschoff (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)

REFILL Hot Wall Delay Model Generic Input Values

Background

Various discrepancies were identified in the generic input values that are used with the REFILL hot wall delay model, which is presently incorporated as a module in BASH. This issue was resolved by replacing the use of generic values with expressions that were derived based on the IMP database and utilize appropriate plant-specific information. These changes were determined to be a closely related group of Non-Discretionary Changes in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Models

1981 Westinghouse Large Break LOCA Evaluation Model
1981 Westinghouse Large Break LOCA Evaluation Model with BART
1981 Westinghouse Large Break LOCA Evaluation Model with BASH

Estimated Effect

In a typical PWR calculation, the hot wall delay period represents a very minor portion of the large break LOCA transient. Replacing the use of generic values with IMP-based expressions was determined to have a negligible effect on results that will be treated as a 0 degree F PCT effect for 10 CFR 50.46 reporting purposes.

LOCBART Rod-Average Oxidation Error

Background

An error was discovered in LOCBART whereby the calculation of the rod-average oxidation incorrectly includes elevations below the bottom of the active fuel. As discussed below, it was determined that correcting this error would either have a negligible effect on, or would result in a reduction in, the rod-average oxidation, so LOCBART updates will be deferred to a future code release. When corrected, this error correction will represent a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Models

1981 Westinghouse Large Break LOCA Evaluation Model with BART
1981 Westinghouse Large Break LOCA Evaluation Model with BASH

Estimated Effect

For typical near-Beginning of Life (BOL) calculations, correcting this error would have a negligible effect on the rod-average oxidation. For calculations beyond BOL, correcting this error would result in a reduction in the rod-average oxidation. In either case, existing analysis results remain conservative.

Inclusion of Required NOTRUMP Version 38.0 Input Variables in SPADES

Background

Following the release of NOTRUMP Version 38.0, which introduced several new input variables to the Evaluation Model, it became necessary to update the SPADES code to reflect these new input variables. These input variables are required to activate the revised model features incorporated into the NOTRUMP Version 38.0 code. This change was determined to be a Discretionary Change in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Models

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

This change simply introduces the new input parameters required by the release of NOTRUMP Version 38.0 to SPADES. The revised NOTRUMP model PCT effects have previously been assessed, and this change to SPADES does not introduce an additional PCT impact.

Use of NOTRUMP Subcooled Steam Table Routines in SPADES

Background

A review of SPADES calculation methodology determined that subcooled fluid node properties were being calculated based on steam tables that were inconsistent with those of NOTRUMP. As a result, slight differences in fluid node conditions could be seen between SPADES and NOTRUMP. The SPADES code has been modified to utilize the NOTRUMP subcooled steam table properties. This reduces perturbations incurred during the steady-state simulation period with NOTRUMP resulting from differences in subcooled steam table properties. This revision was determined to be a Discretionary Change in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Models

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

The nature of this change leads to an estimated PCT impact of 0 degrees F.

Accumulator Line Friction Factor in the NOTRUMP Evaluation Model

Background

The current input for the NOTRUMP evaluation model uses a dimensionless value of 0.013 for line loss friction factor in the accumulator injection lines. This is based on fully developed, turbulent flow in the general pipe size range for accumulator injection lines applicable to Westinghouse designed Nuclear Steam Supply Systems. However, in small break LOCA during accumulator injection, the flow seldom obtains velocities high enough to support the fully developed, turbulent flow value. Taking this into account yields a friction factor on the order of 0.016. This revision was determined to be a Discretionary Change in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Models

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

The nature of this change leads to an estimated PCT impact of 0 degrees F.

Improved Code Input/Output and Diagnostics, and General Code Maintenance

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 blocks of coding were rewritten to eliminate inactive coding, optimize the active coding, and improve commenting, both for enhanced usability and to facilitate code debugging when necessary. These changes were determined to be Discretionary Changes in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Models

1981 Westinghouse Large Break LOCA Evaluation Model
1981 Westinghouse Large Break LOCA Evaluation Model with BART
1981 Westinghouse Large Break LOCA Evaluation Model with BASH
1975 Westinghouse Small Break LOCA Evaluation Model with WFLASH
1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

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

**EMERGENCY CORE COOLING SYSTEM (ECCS) EVALUATION MODEL PEAK
CLADDING TEMPERATURE (PCT) MARGIN ALLOCATIONS**

LARGE BREAK LOCA PCT MARGIN UTILIZATION

Evaluation Model: 1981 EM with BASH
Fuel: 17X17 V5H w/IFM, non-IFBA, 275 psig
Peaking Factor: $F_Q=2.50$, $F_{dH}=1.65$
SG Tube Plugging: 10%
Power Level: 3565 MW_{th}
Limiting transient: $C_D=0.4$, Min. SI, Reduced Tav_g

A. ANALYSIS OF RECORD (Rerating 8/92)

Peak Cladding Temperature (PCT): 1916°F (1)

B. PRIOR PERMANENT ECCS MODEL ASSESSMENTS $\Delta PCT = 63^\circ F$ (2)

C. PLANNED PLANT CHANGE EVALUATIONS

- 1. Loose Parts $\Delta PCT = 20^\circ F$ (3)
- 2. Containment Purge $\Delta PCT = 0^\circ F$ (4)
- 3. Cycle 10 Fuel Assembly Design Changes $\Delta PCT = 95^\circ F$ (5)
- 4. Fuel Rod Crud $\Delta PCT = 0^\circ F$ (6)

TOTAL PLANNED PLANT CHANGE ASSESSMENTS $\Delta PCT = 115^\circ F$

D. 2001 10 CFR 50.46 MODEL ASSESSMENTS
(Permanent Assessment of PCT Margin)

- 1. None $\Delta PCT = 0^\circ F$

E. TEMPORARY ECCS MODEL ISSUES

- 1. None $\Delta PCT = 0^\circ F$

F. OTHER MARGIN ALLOCATIONS

- 1. Transition Core Penalty $\Delta PCT = 0^\circ F$ (7)
- 2. Cold Leg Streaming Temperature Gradient $\Delta PCT = 0^\circ F$ (8)
- 3. Rebaseline of Limiting AOR Case (12/96) $\Delta PCT = -63^\circ F$ (9)
- 4. Adjustment for LOCBART Zirc-Water Oxidation Error $\Delta PCT = -5^\circ F$ (10)

LICENSING BASIS PCT + MARGIN ALLOCATIONS **PCT = 2026°F**

**CUMULATIVE ABSOLUTE MAGNITUDE OF PCT CHANGES
SINCE LAST 30-DAY REPORT (LETTER ET 99-0045)** $\Sigma|\Delta PCT| = 15^\circ F$

Notes/References:

1. Westinghouse Topical Report WCAP-13456, "Wolf Creek Generating Station NSSS Rerating Licensing Report," October 1992.
2. Westinghouse to WCNOC letter SAP-01-105, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, 10 CFR 50.46 Annual Notification and Reporting for 2000," March 6, 2001.
3. Westinghouse to WCNOC letter SAP-90-148, "Wolf Creek Nuclear Operating Corporation, RCS Loose Parts Evaluation," April 18, 1998.
4. Westinghouse to WCNOC letter SAP-94-102, "Containment Mini purge Isolation Valve Stroke Time Increase," January 12, 1994.
5. Westinghouse to WCNOC letter 97SAP-G-0009, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, Safety Assessment for the Wolf Creek Generating Station with ZIRLO™ Fuel Assemblies," February 7, 1997.
6. Westinghouse to WCNOC letter 97SAP-G-0075, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, Wolf Creek Crud Deposition/Axial Offset Anomaly Safety Evaluation," September 29, 1997.
7. Transition core penalty applies on a cycle-specific basis for reloads utilizing both V5H (with IFMs) and STD fuel until a full core of V5H is achieved. Since a full core of V5H has been attained, the 50 degrees F transition core penalty is no longer applicable and has been removed.
8. Westinghouse to WCNOC letter SAP-93-701, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, 10 CFR 50.46 Notification and Reporting Information," January 25, 1993. [A PCT benefit of 2.5 degrees Fahrenheit was assessed; however, a benefit of zero (0) degrees Fahrenheit will be tracked for reporting purposes.]
9. Westinghouse to WCNOC letter SAP-99-148, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, 10 CFR 50.46 BART/BASH Evaluation Model Mid-Year Notification and Reporting for 1999," September 22, 1999.
10. This assessment is a function of analysis PCT plus certain margin allocations and as such may increase/decrease with margin allocation changes.

SMALL BREAK LOCA PCT MARGIN UTILIZATION

Evaluation Model: 1985 EM with NOTRUMP
Fuel: 17X17 V5H w/IFM, non-IFBA, 275 psig
Peaking Factor: $F_Q=2.50$, $F_{dH}=1.65$
SG Tube Plugging: 10%
Power Level: 3565 MW_{th}
Limiting transient: 3-inch Break

A. ANALYSIS OF RECORD (Rerating 8/92)

Peak Cladding Temperature (PCT): 1510°F (1)

B. PRIOR PERMANENT ECCS MODEL ASSESSMENTS $\Delta PCT = 44^\circ F$ (2)

C. PLANNED PLANT CHANGE EVALUATIONS

1. Loose Parts $\Delta PCT = 45^\circ F$ (3)
2. Cycle 10 Fuel Assembly Design Changes $\Delta PCT = 1^\circ F$ (6)
3. Reduced Feedwater Inlet Temperature $\Delta PCT = 10^\circ F$ (4)
4. Fuel Rod Crud $\Delta PCT = 4^\circ F$ (5)
5. Auxiliary Feedwater Temperature Increase $\Delta PCT = 16^\circ F$ (8)

TOTAL PLANNED PLANT CHANGE ASSESSMENTS $\Delta PCT = 76^\circ F$

D. 2001 10 CFR 50.46 MODEL ASSESSMENTS (Permanent Assessment of PCT Margin)

1. None $\Delta PCT = 0^\circ F$

E. TEMPORARY ECCS MODEL ISSUES

1. None $\Delta PCT = 0^\circ F$

F. OTHER MARGIN ALLOCATIONS

1. Cold Leg Streaming Temperature Gradient $\Delta PCT = 7^\circ F$ (7)

LICENSING BASIS PCT + MARGIN ALLOCATIONS PCT = 1637°F

**CUMULATIVE ABSOLUTE MAGNITUDE OF PCT CHANGES
SINCE LAST 30-DAY REPORT (LETTER ET 99-0024) $\Sigma|\Delta PCT| = 35^\circ F$**

Notes/References:

1. Westinghouse Topical Report WCAP-13456, "Wolf Creek Generating Station NSSS Rerating Licensing Report," October 1992.
2. Westinghouse to WCNOG letter SAP-00-105, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, 10 CFR 50.46 Annual Notification and Reporting for 2000," March 6, 2001.
3. Westinghouse to WCNOG letter SAP-90-148, "Wolf Creek Nuclear Operating Corporation, RCS Loose Parts Evaluation," April 18, 1990.
4. Westinghouse to WCNOG letter SAP-96-119, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, Small Break LOCA Evaluation for Reduced Feedwater Temperature," May 30, 1996.
5. Westinghouse to WCNOG letter 97SAP-G-0075, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, Wolf Creek Crud Deposition/Axial Offset Anomaly Safety Evaluation," September 29, 1997. (This penalty will be carried until such time it is determined to no longer apply.)
6. Westinghouse to WCNOG letter 97SAP-G-0009, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, Safety Assessment for the Wolf Creek Generating Station with ZIRLO™ Fuel Assemblies," February 7, 1997.
7. Westinghouse to WCNOG letter SAP-93-701, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, 10 CFR 50.46 Notification and Reporting Information," January 25, 1993.
8. Westinghouse to WCNOG letter SAP-98-138, "Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, Assessment of an Increase in Auxiliary Feedwater Temperature," July 23, 1998.