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Our ref: LTR-NRC-23-5

March 10, 2023

U.S. Nuclear Regulatory Commission
10 CFR 50.46 Annual Notification and Reporting for 2022

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 loss-of-coolant accident (LOCA) and large-break LOCA ECCS evaluation models for 2022 is provided as Attachment 1. Westinghouse has categorized these changes or errors into two separate groups as defined in Reference 1, which may include subgroups with or without peak cladding temperature (PCT) impact:

- Discretionary Changes
- Non-Discretionary Changes

This annual notification is being provided since it affects information previously submitted in Westinghouse topical reports. It is noted that plant-specific 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 notifies licensees utilizing these Westinghouse ECCS evaluation models in their plant licensing basis of the appropriate reportable changes.

For future referencing convenience, the 2022 10 CFR 50.46 reportable changes provided in Attachment 1, together with the 2021 formulation offered in Reference 2 constitutes the 2022 formulation of the Westinghouse ECCS evaluation models.

Sincerely,

Zachary S. Harper Manager
Licensing Engineering

Our ref: LTR-NRC-23-5
March 10, 2023

References:

1. ET-NRC-92-3755, "Westinghouse Methodology for Implementation of 10CFR50.46 Reporting," N. J. Liparulo, Westinghouse to NRC Document Control Desk, October 1992. (WCAP-13451)

2. LTR-NRC-22-8, "U.S. Nuclear Regulatory Commission 10 CFR 50.46 Annual Notification and Reporting for 2021," Z. S. Harper, February 2022.

Attachment:

1. Standard Format Text for Changes and Enhancements to the Westinghouse Evaluation Models for 2022 (8 pages, including cover page)

Attachment 1

Standard Format Text for Changes and Enhancements to the Westinghouse Evaluation Models for 2022

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Discretionary Changes with Negligible PCT Impact

- GENERAL CODE MAINTENANCE

Non-Discretionary Changes with Negligible PCT Impact

- ERROR IN HOOP STRESS USED IN CLADDING RUPTURE MODEL
- NON-CONSERVATION OF ENERGY IN THE GENERALIZED ENERGY DEPOSITION MODEL (2016 Westinghouse FULL SPECTRUM LOCA Evaluation Model)
- NON-CONSERVATION OF ENERGY IN THE GENERALIZED ENERGY DEPOSITION MODEL (1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model and 2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM)

DISCRETIONARY CHANGES WITH NEGLIGIBLE PCT IMPACT

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 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)

2016 Westinghouse **FULL SPECTRUM™** LOCA Evaluation Model

Estimated Effect

The nature of these changes leads to an estimated peak cladding temperature impact of 0°F.

NON-DISCRETIONARY CHANGES WITH NEGLIGIBLE PCT IMPACT

ERROR IN HOOP STRESS USED IN CLADDING RUPTURE MODEL

Background

Two different hoop stress variables are calculated in WCOBRA/TRAC-TF2. The first is calculated using Equation 8-40 of WCAP-16996-P-A, Revision 1 [1] and is used in the cladding elastic deformation model. The second is calculated using Equation 8-51 of WCAP-16996-P-A, Revision 1 and is used in the cladding creep deformation and cladding rupture models. For two instances within the cladding rupture logic, the hoop stress calculated using Equation 8-40 of WCAP-16996-P-A, Revision 1 is used whereas the hoop stress calculated using Equation 8-51 of WCAP-16996-P-A, Revision 1 should be used. The correction of this error represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model(s)

2016 Westinghouse FULL SPECTRUM LOCA Evaluation Model

Estimated Effect

The error was evaluated to have a negligible impact on the calculated results for **FSLOCA™** EM analyses, leading to an estimated peak cladding temperature (PCT) impact of 0°F.

Reference(s)

1) WCAP-16996-P-A, Revision 1, “Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology),” November 2016.

NON-CONSERVATION OF ENERGY IN THE GENERALIZED ENERGY DEPOSITION MODEL

Background

The Generalized Energy Deposition Model (GEDM) used within WCOBRA/TRAC-TF2 is described in Section 9.6.2 of WCAP-16996-P-A Revision 1 [1]. Non-conservation of the deposited energy was discovered to exist, whereby a very small fraction of the redistributed energy was not being included in the core balance rods. The energy deposited to the hot rod and hot assembly was confirmed to be conserved and correct. This item represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model(s)

2016 Westinghouse FULL SPECTRUM LOCA Evaluation Model

Estimated Effect

The error was qualitatively evaluated, and the nature of the error leads to an estimated peak cladding temperature impact of 0°F.

Reference(s)

1) WCAP-16996-P-A, Revision 1, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)," November 2016.

NON-CONSERVATION OF ENERGY IN THE GENERALIZED ENERGY DEPOSITION MODEL

Background

The Generalized Energy Deposition Model (GEDM) used within WCOBRA/TRAC is described in Section 8-6-2 of WCAP-12945-P-A [1] and Section 8-6-2 of WCAP-16009-P-A [2]. Non-conservation of the deposited energy was discovered to exist, whereby a very small fraction of the redistributed energy was not being included in the core balance rods. The energy deposited to the hot rod and hot assembly was confirmed to be conserved and correct. This item represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model(s)

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

Estimated Effect

The error was qualitatively evaluated, and the nature of the error leads to an estimated peak cladding temperature impact of 0°F.

Reference(s)

1) WCAP-12945-P-A, Revision 2 Volume 1, and Revision 1 Volumes 2 - 5, “Code Qualification Document for Best Estimate LOCA Analysis,” March 1998.
2) WCAP-16009-P-A, Revision 0, “Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Of Uncertainty Method (ASTRUM),” January 2005.