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RC-02-0086

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U. S. Nuclear Regulatory Commission
Washington, DC 20555

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
ECCS EVALUATION MODEL REVISIONS ANNUAL REPORT

Attached is the 2002 Emergency Core Cooling System (ECCS) Evaluation Model Revisions Annual Report for the Virgil C. Summer Nuclear Station (VCSNS). This report is being submitted pursuant to 10CFR50.46, which requires licensees to notify the NRC on at least an annual basis of corrections to or changes in the ECCS Evaluation Models.

Peak Clad Temperature (PCT) sheets are enclosed. All necessary revisions for any non-zero, non-discretionary, PCT change to Section C have been included. Plant specific errors in the application of the model are also provided in Section C. Several titular changes have been made to the Peak Clad Temperature (PCT) Summary sheets. A detailed discussion of these changes is included.

Attachment 1 describes changes made to the PCT sheets and the reporting procedure used by Westinghouse. These changes result from the recent changes to 10 CFR 50.59 and are consistent with the requirements of 10 CFR 50.46. In like fashion, VCSNS will adopt these changes in this and future reports.

Attachment 2 provides a discussion of the changes and enhancements to the evaluation models for 2001.

Attachment 3 provides the LOCA PCT rackup sheets including references.

VCSNS has identified an editorial error in the Margin Recovery value in Table 3 of the 2001 ECCS Evaluation Model Revisions Annual Report. The value should have been reported as negative; however, the value for the Licensing Basis PCT + Margin Allocations was reported correctly.

Pool

I declare that the statements and matters set forth herein are true and correct to the best of my knowledge, information, and belief.

If you have any questions, please call Mr. Arnie J. Cribb, Jr. at (803) 345-4346.

Very truly yours,



Stephen A. Byrne

AJC/SAB
Attachments

c: N. O. Lorick
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NRC Resident Inspector
NSRC
RTS (0-L-99-0152)
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DMS (RC-02-0086)

STATE OF SOUTH CAROLINA :
: COUNTY OF FAIRFIELD :

TO WIT :

I hereby certify that on the 17th day of MAY 2002, before me, the subscriber, a Notary Public of the State of South Carolina personally appeared Stephen A. Byrne, being duly sworn, and states that he is the Senior Vice President, Nuclear Operations of the South Carolina Electric & Gas Company, a corporation of the State of South Carolina, that he provides the foregoing response for the purposes therein set forth, that the statements made are true and correct to the best of his knowledge, information, and belief, and that he was authorized to provide the response on behalf of said Corporation.

WITNESS my Hand and Notarial Seal



Notary Public

My Commission Expires

OCTOBER 2, 2010
Date

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Attachment 1

Changes to 10 CFR 50.46 PCT Sheets Reporting Procedure

Westinghouse has notified VCSNS that changes have been made to the 10 CFR 50.46 PCT Sheets and the Reporting Procedure described in WCAP-13451. These changes were made to comply with the recent changes to 10 CFR 50.59. The changes to 10 CFR 50.59 have clarified that if another regulation applies in the determination of NRC reportability, that regulation should be used instead of 10 CFR 50.59. 10 CFR 50.46 is such a regulation that applies to the LOCA area.

In rulemaking recently issued for the core power uncertainty relaxation (Federal Register: June 1, 2000 Volume 65, Number 106, page 34918), the NRC unambiguously states that changes to plant specific design inputs have always fallen under the 10 CFR 50.46 reporting umbrella.

As a result of the changes to 10 CFR 50.59 reporting requirement, coupled with the NRC reporting position noted above, the following changes in the Westinghouse 10 CFR 50.46 Reporting procedure are implemented to remove the circular logic between 10 CFR 50.46 and 10 CFR 50.59 embodied in WCAP-13451.

Planned plant change LOCA safety evaluations, which have been previously categorized by Westinghouse under 10 CFR 50.59, are considered by to be reportable under 10 CFR 50.46. Therefore, Westinghouse will continue to present PCT changes on the PCT sheet in separate, but retitled, categories.

Standardized PCT Sheet Format Changes

	Current Title	New Title
Section B	10 CFR 50.59 SAFETY EVALUATION	PLANNED PLANT CHANGE EVALUATIONS
Section C	CURRENT YEAR 10 CFR 50.46 MODEL ASSESSMENTS	CURRENT YEAR PERMANENT ECCS MODEL ASSESSMENT

Planned plant change evaluations performed by Westinghouse will continue to be documented as part of that evaluation and will not be necessarily presented in the standardized reporting page endorsed by WCAP-13451 for errors and model changes. Planned plant change evaluations will continue to be included in Westinghouse 10 CFR 50.46 Annual or Mid-Year Reports only as a line item on the standardized PCT sheet.

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Attachment 2

Changes and Enhancements to the ECCS Evaluation Models for 2001

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Non-Discretionary Changes with PCT Impact

None

Non-Discretionary Changes with No PCT Impact

REFILL Hot Wall Delay Model Generic Input Values
LOCBART Rod-Average Oxidation Error

Enhancements/Forward-Fit Discretionary Changes

Inclusion of Required NOTRUMP Version 38.0 Input Variables in SPADES
Use of NOTRUMP Subcooled Steam Table Routines in SPADES
Accumulator Line Friction Factor in the NOTRUMP Evaluation Model
Improved Code I/O and Diagnostics, and General Code Maintenance

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°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-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°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 NSSSs. 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°F.

Improved Code I/O 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°F.

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Attachment 3

LOCA Peak Clad Temperature (PCT) Rackup Sheets

Large Break LOCA Peak Clad Temperature Summary

Plant Name: V. C. Summer
Utility Name: South Carolina Electric & Gas
Revision Date: 2/12/02

Analysis Information

EM: BASH **Analysis Date:** 10/95 **Limiting Break Size:** Cd = 0.4
FQ: 2.4 **FdH:** 1.62
Fuel: Vantage + **SGTP (%):** 10
Notes: Analysis-Of-Record was done with FQ=2.50 and FdH = 1.70

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	2099	1	(a)
MARGIN ALLOCATIONS (Delta PCT)			
A. PRIOR PERMANENT ECCS MODEL ASSESSMENTS			
1. SI Error Reanalysis (Plant Specific)	-90	2	(a,b)
2. Accumulator Line/Pressurizer Surge Line Data, LOCBART Spacer GridSingle-Phase Heat Transfer Error, LOCBART Zirc-Water Oxidation Error, and Reanalysis of Limiting AOR Case	153	2	(a,c)
3. LOCBART Vapor Film Flow Regime Heat Transfer Error	-15	3	
4. LOCBART Cladding Emissivity Errors	-10	4	
B. PLANNED PLANT CHANGE EVALUATIONS			
1. None	0		
C. 2002 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 =	2137

*It is recommended that these temporary PCT allocations which address current LOCA model issues not be considered with respect to 10 CFR 50.46 reporting requirements.

References:

1. CGE-95-0009-SGUL, "Revised Large Break LOCA Results for Up-rating Submittal," October 24, 1995.
2. CGE-99-044, "South Carolina Electric and Gas Company, Virgil C. Summer Nuclear Station, 10 CFR 50.46 BART/BASH Evaluation Model, Mid-Year Notification and Reporting for 1999," September 17, 1999.
3. CGE-00-044, "South Carolina Electric and Gas Company, Virgil C. Summer Nuclear Station, 10 CFR 50.46 Appendix K (BART/BASH/NOTRUMP) Evaluation Model, Mid-Year Notification and Reporting for 2000", June 30, 2000.
4. CGE-00-112, "South Carolina Electric and Gas Company, Virgil C. Summer Nuclear Station, 10 CFR 50.46 BART/BASH Evaluation Model Mid-Year Notification and Reporting for 2000," December 2000.

Notes:

- (a) Analysis was done for Delta-75 steam generators and core power at 2900 MWt.
- (b) This plant specific reanalysis addressed the correction of Safety Injection Performance Inputs. These results incorporate the SATAN/LOCTA Fluid Conditions Translation Error and the Accumulator Pressure and Water Volume Uncertainties evaluation, so these PCT penalties are no longer applicable. IFBA fuel is limiting compared to non-IFBA fuel.
- (c) This reanalysis was based on the SI Error reanalysis; modelled a reduction in FQ from 2.5 to 2.4, a reduction in FdH from 1.70 to 1.62, and a reduction in P-bar-HA from 1.514 to 1.443; and addressed the following issues: Accumulator Line/Pressurizer Surge Line Data, LOCBART Spacer Grid Single-Phase Heat Transfer Error, and LOCBART Zirc-Water Oxidation Error. IFBA fuel is limiting compared to non-IFBA fuel.

Small Break LOCA Peak Clad Temperature Summary

Plant Name: V. C. Summer
Utility Name: South Carolina Electric & Gas
Revision Date: 2/12/02

Analysis Information

EM: NOTRUMP **Analysis Date:** 02/94 **Limiting Break Size:** 2 inch
FQ: 2.45 **FdH:** 1.62
Fuel: Vantage + **SGTP (%):** 10
Notes: Limiting Break Size shifted from 2 inch to 3 inch (b,d)

	Clad Temp (°F) Ref.		Notes
LICENSING BASIS			
Analysis-Of-Record PCT	1823	1	(a)
MARGIN ALLOCATIONS (Delta PCT)			
A. PRIOR PERMANENT ECCS MODEL ASSESSMENTS			
1. LUCIFER Error Corrections	-16	3	
2. Effect of SI in Broken Loop	150	3	
3. Effect of Improved Condensation Model	-150	3	
4. Axial Nodalization, RIP Model Revision and SBLOCTA Error Corrections Analysis	96	4	
5. Boiling Heat Transfer Correlation Error	-6	5	
6. Steam Line Isolation Logic Error	18	5	
7. NOTRUMP Specific Enthalpy Error	20	6	
8. SALIBRARY Double Precision Error	-15	6	
9. SBLOCTA Fuel Rod Initialization Error	10	7	
10. NOTRUMP Mixture Level Tracking / Region Depletion Errors	13	9	
B. PLANNED PLANT CHANGE EVALUATIONS			
1. Increased Accumulator Pressure and Water Volume Uncertainties	34	2	(b)
2. Annular Blankets	10	2	
3. Main Feedwater Temperature Increase Evaluation	0	10	
C. 2002 PERMANENT ECCS MODEL ASSESSMENTS			
1. None	0		
D. TEMPORARY ECCS MODEL ISSUES*			
1. None	0		
E. OTHER			
1. Burst and Blockage/Time in Life	245	9	(c,e)
2. Margin Recovery (SI Performance Inputs Evaluation)	-36	8	(d)
LICENSING BASIS PCT + MARGIN ALLOCATIONS	PCT =	2196	

*It is recommended that these temporary PCT allocations which address current LOCA model issues not be considered with respect to 10 CFR 50.46 reporting requirements.

References:

1. CGE-93-0054-SGUL, "SECL-93-036, Rev. 1," March 9, 1994.
2. CGE-99-008, "South Carolina Electric and Gas Company, Virgil C. Summer Station, 10 CFR 50.46 Annual Notification and Reporting for 1998," March 5, 1999.
3. CGE-94-205, "South Carolina Electric and Gas Company, Virgil C. Summer Station, 10 CFR 50.46 Notification and Reporting Information," February 8, 1994.
4. CGE-94-228, "South Carolina Electric and Gas Company, Virgil C. Summer Station, SBLOCTA Axial Nodalization," October 27, 1994.
5. CGE-95-201, "South Carolina Electric and Gas Company, Virgil C. Summer Station, 10 CFR 50.46 Notification and Reporting Information," February 3, 1995.
6. CGE-96-202, "South Carolina Electric and Gas Company, Virgil C. Summer Station, 10 CFR 50.46 Annual Notification and Reporting," February 9, 1996.
7. CGE-96-213, "South Carolina Electric and Gas Company, Virgil C. Summer Station, 10 CFR 50.46 Small Break LOCA Notification and Reporting," July 8, 1996.
8. CGE-00-006, "South Carolina Electric and Gas Company, Virgil C. Summer Nuclear Station, 10 CFR 50.46 Annual Notification and Reporting for 1999," February 25, 2000.
9. CGE-00-044, "South Carolina Electric and Gas Company, Virgil C. Summer Nuclear Station, 10 CFR 50.46 Appendix K (BART / BASH / NOTRUMP) Evaluation Model, Mid-Year Notification and Reporting for 2000," June 30, 2000.
10. CGE-00-063, "Safety Evaluation for Increased Main Feedwater Temperature (SECL-00-118)," August 25, 2000.

Notes:

- (a) AOR performed for core power = 2900 MWt and Delta-75 steam generators.
- (b) The SBLOCA evaluation for increased accumulator pressure and water volume uncertainties causes the limiting break equivalent diameter to shift from 2-inch to 3-inch. The 34°F value does not include the effect on SBLOCA burst/blockage behavior.
- (c) This assessment is a function of base PCT plus margin allocation and as such will increase/decrease with margin allocation changes.
- (d) The Margin Recovery (SI Performance Evaluation) resulted in a 36 °F PCT benefit. Note that the evaluation considered the 2 inch and 3 inch break and resulted in the limiting break equivalent diameter to remain shifted from 2 inch to 3 inch break.
- (e) Value includes previous Burst and Blockage / Time in Life penalty SPIKE Correlation Revision penalty (1999 Annual Report), and consideration of a new penalty due to item C.1 (NOTRUMP Mixture Level Tracking / Region Depletion Errors).