VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

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United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No.: 99-279
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Docket Nos.: 50-280/281
50-338/339
License Nos.: DPR-32/37
NPF-4/7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY AND NORTH ANNA POWER STATIONS UNITS 1 AND 2
REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) EVALUATION MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10CFR50.46

Pursuant to 10CFR50.46(a)(3)(ii) Virginia Electric and Power Company is providing information concerning changes to the ECCS Evaluation Models and their application in existing licensing analyses. Information is also provided which quantifies the effect of these changes upon reported results for North Anna and Surry Power Stations and demonstrates continued compliance with the acceptance criteria of 10CFR50.46.

Attachment 1 contains excerpted portions of Westinghouse reports describing the changes to the Westinghouse ECCS Evaluation Models which are applicable to North Anna and Surry and have been implemented during calendar year 1998.

Information regarding the effect of the ECCS Evaluation Model changes upon the reported LOCA analysis of record (AOR) results is provided for the North Anna and Surry Power Stations in Attachments 2 and 3, respectively. To summarize the information in Attachments 2 and 3, the calculated peak cladding temperature (PCT) for the small and large break LOCA analyses for North Anna and Surry are given below. None of these results include significant changes, based on the criterion in 10CFR50.46(a)(3)(i).

North Anna Unit 1 - Small break:	1675°F
North Anna Unit 1 - Large break:	2068°F
North Anna Unit 2 - Small break:	1676°F
North Anna Unit 2 - Large break:	2086°F
Surry Units 1 and 2 - Small break:	1717°F
Surry Units 1 and 2 - Large break:	2113°F

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We have evaluated these issues and the associated changes in the applicable licensing basis PCT results. These results demonstrate compliance with the requirements of

10CFR50.46(b). No further action is required to demonstrate compliance with 10CFR50.46 requirements.

If you have any questions or require additional information, please contact us.

Very truly yours,

J. H. McCarthy
Manager – Nuclear Licensing and Operations Support

Commitments made in this letter: None

Attachments:

1) Westinghouse Report of ECCS Evaluation Model Changes - North Anna Units 1 and 2 and Surry Units 1 and 2

2) Effect of ECCS Evaluation Model Changes - North Anna Units 1 and 2

3) Effect of ECCS Evaluation Model Changes - Surry Units 1 and 2

cc: Regional Administrator
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Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

Michael J. Morgan
NRC Senior Resident Inspector
North Anna Power Station

ATTACHMENT 1

WESTINGHOUSE REPORT OF
ECCS EVALUATION MODEL CHANGES

NORTH ANNA UNITS 1 AND 2
AND
SURRY UNITS 1 AND 2

SATIMP TRUNCATION ERROR

Background

Various methods exist for entering input data to the SATIMP code, which is used to generate the plant-specific input models for SATAN-VI. An error was discovered in the SATIMP whereby different methods of entering the input data could lead to minor differences in the resulting SATAN-VI input values, due to differences in truncation methods. This correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model

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

The nature of this error leads to an estimated PCT impact of 0°F.

SATAN-VI MOMENTUM FLUX LOGIC ERRORS

Background

An error in the SATAN-VI initialization logic caused momentum flux calculations to be skipped for the flow paths on the vessel side of the break, which is contrary to the guidelines that apply for modeling momentum flux in the 1981 EM version of SATAN-VI. This error has been corrected in the latest version of the code, along with two closely related errors in the momentum flux pressure drop calculations which were discovered during the course or the model review. These corrections were determined to be a closely related group of Non-Discretionary Changes in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model

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

Representative plant calculations showed that the corrections to the SATAN-VI momentum flux logic generally result in a small PCT benefit that is conservatively being tracked as 0°F for 10CFR50.46 reporting purposes.

SATAN-VI TRANSITION BOILING LIQUID DENSITY ERROR

Background

In SATAN-VI, the cladding surface heat transfer coefficient in the transition boiling regime is computed using the Westinghouse Transition Boiling Correlation. A minor error was discovered in the calculation of the liquid density that is used with this correlation under certain conditions. This correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model

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

The nature of this error leads to an estimated PCT impact of 0°F.

BASHER HEAT LINK AREA ERROR

Background

BASHER was issued in the 1981 Westinghouse Large Break LOCA Evaluation Model with BASH to generate the plant-specific input models for BASH. An error was discovered in the BASHER calculation of the lower plenum metal-to-fluid heat transfer area. This error only applies for plants with square holes in the lower core plate, a configuration which is atypical of Westinghouse plants. This correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model

1981 Westinghouse Large Break LOCA Evaluation Model with BASH

Estimated Effect

A review of existing plant analyses found no cases with square holes in the lower core plate. For a hypothetical case with square holes in the lower core plate, the nature of the error leads to an estimated PCT impact of 0°F.

NOTRUMP IMPLICIT GRAVITY HEAD ERROR (AP-600 IMPLEMENTATION)

Background

An error was discovered in the coding used for the implementation of implicit treatment of gravity head in NOTRUMP for continuous contact flow links. This error only affects advanced plant calculations which invoke these models. This error correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP (AP600 Implementation)

Estimated Effect

The nature of this error leads to no impact on the calculated PCT for all standard Westinghouse PWR evaluation model applications.

NOTRUMP DROPLET FALL MODEL ERROR (AP600 IMPLEMENTATION)

Background

An error was discovered in the implementation of certain droplet fall models in NOTRUMP. This error only affects advanced plant calculations which invoke these models. This error correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP (AP600 Implementation)

Estimated Effect

The nature of this error leads to no impact on the calculated PCT for all standard Westinghouse PWR evaluation model applications.

SBLOCTA PROGRAMMING ERROR IN ROD-TO-ROD RADIATION MODEL

Background

An error was discovered in the SBLOCTA code related to the calculations for rod-to-rod radiation heat transfer. The code was using incorrect units for the rod-to-rod pitch when computing the view factors. This was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model

1975 Westinghouse Small Break LOCA Evaluation Model with WFLASH
1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

Due to the conservative methodology for specifying the power ratios among the fuel rods in a licensing basis small break LOCA analysis, there is little difference between the temperatures calculated for the hot rod and the surrounding rods which form the basis for the radiation heat transfer temperature sink in the problem. For a small break LOCA transient, the contribution to the peak cladding temperature from rod-to-rod radiation is at most a few degrees, even for conditions with temperatures approaching the 2200°F limit. As a result, rod-to-rod radiation is not modeled in licensing basis analyses, and there is no effect on any past or current analyses. Further, sensitivity calculations confirmed that correcting the error would have a negligible effect on results for a hypothetical case modeling rod-to-rod radiation, as expected.

ATTACHMENT 2

EFFECT OF ECCS EVALUATION MODEL CHANGES

NORTH ANNA UNITS 1 AND 2

Effect of ECCS Evaluation Model Changes - North Anna Unit 1

The information provided herein is applicable to North Anna Power Station, Unit 1. It is based upon reports from Westinghouse Electric Corporation for issues involving the ECCS evaluation models and plant-specific application of the models in the existing analyses. Peak cladding temperature (PCT) values and margin allocations represent issues for which permanent resolutions have been implemented. The assessments for small break and large break LOCA are presented in Sections A and B, respectively.

Section A - Small Break LOCA Margin Utilization - North Anna Unit 1

A. PCT for Analysis of Record	1704°F	(1)
B. Prior PCT Assessments Allocated to AOR	**-29°F**	
1. NOTRUMP Specific Enthalpy Error	+20°F	(2)
2. SALIBRARY Double Precision Errors	-15°F	(2)
3. Fuel Rod Initialization Error	+10°F	(3)
4. Loop Seal Elevation Error	-44°F	(3)
SBLOCA Augmented PCT for AOR	1675°F	
C. PCT Assessments for 10CFR50.46(a)(3)(i) Accumulation	**0°F**	
SBLOCA Licensing Basis PCT (AOR PCT + PCT Assessments)	1675°F	

Section B - Large Break LOCA Margin Utilization - North Anna Unit 1

A. PCT for Analysis of Record	2013°F	(1)
B. Prior PCT Assessments Allocated to AOR	**40°F**	
1. LBLOCA/Seismic SG Tube Collapse	+30°F	(1)
2. BASH Accumulator Empty Flag	+10°F	(1)
LBLOCA Augmented PCT for AOR	2053°F	
C. PCT Assessments for 10CFR50.46(a)(3)(i) Accumulation {1}	**15°F**	
1. Translation of Fluid Conditions from SATAN to LOCTA	+15°F	(4)
LBLOCA Licensing Basis PCT (AOR PCT + PCT Assessments)	2068°F	

Notes { } and References ( ) provided below.

Effect of ECCS Evaluation Model Changes - North Anna Unit 2

The information provided herein is applicable to North Anna Power Station, Unit 2. It is based upon reports from Westinghouse Electric Corporation for issues involving the ECCS evaluation models and plant-specific application of the models in the existing analyses. Peak cladding temperature (PCT) values and margin allocations represent issues for which permanent resolutions have been implemented. The assessments for small break and large break LOCA are presented in Sections A and B, respectively.

Section A - Small Break LOCA Margin Utilization - North Anna Unit 2

A. PCT for Analysis of Record	1704°F	(1)
B. Prior PCT Assessments Allocated to AOR	**-29°F**	
1. NOTRUMP Specific Enthalpy Error	+20°F	(2)
2. SALIBRARY Double Precision Errors	-15°F	(2)
3. Fuel Rod Initialization Error	+10°F	(3)
4. Loop Seal Elevation Error	-44°F	(3)
SBLOCA Augmented PCT for AOR	1675°F	
C. PCT Assessments for 10CFR50.46(a)(3)(i) Accumulation {1}	**1°F**	
1. Removal of Part-Length CRDMs	+1°F	(5)
SBLOCA Licensing Basis PCT (AOR PCT + PCT Assessments)	1676°F	

Section B - Large Break LOCA Margin Utilization - North Anna Unit 2

A. PCT for Analysis of Record	2013°F	(1)
B. Prior PCT Assessments Allocated to AOR	**40°F**	
1. LBLOCA/Seismic SG Tube Collapse	+30°F	(1)
2. BASH Accumulator Empty Flag	+10°F	(1)
LBLOCA Augmented PCT for AOR	2053°F	
C. PCT Assessments for 10CFR50.46(a)(3)(i) Accumulation {1}	**33°F**	
1. Translation of Fluid Conditions from SATAN to LOCTA	+15°F	(4)
2. Removal of Part-Length CRDMs	+18°F	(5)
LBLOCA Licensing Basis PCT (AOR PCT + PCT Assessments)	2086°F	

Notes { } and References ( ) are provided below.

Effect of ECCS Evaluation Model Changes - North Anna

Notes:

{1} The accumulation of changes (sum of absolute magnitudes) is less than 50°F and is not significant, as defined in 10CFR50.46(a)(3)(i).

References:

(1) Letter from J. P. O'Hanlon (VEPCO) to Document Control Desk (USNRC), "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, 30-Day Report of ECCS Evaluation Model Changes Per Requirements of 10CFR50.46," Serial No. 95-608, November 29, 1995.

(2) Letter from J. P. O'Hanlon (Va. Electric & Power Co.) to USNRC, "Virginia Electric and Power Company, North Anna and Surry Power Station Units 1 and 2, Report of ECCS Evaluation Model Changes and 30-Day Report of ECCS Evaluation Model Changes Per Requirements of 10CFR50.46," Serial No. 96-111, March 14, 1996.

(3) Letter from J. P. O'Hanlon (Va. Electric & Power Co.) to USNRC, "Virginia Electric and Power Company, North Anna Power and Surry Power Station Units 1 and 2, Report of ECCS Evaluation Model Changes and 30-Day Report of ECCS Evaluation Model Changes Per Requirements of 10CFR50.46" Serial No. 96-390, August 1, 1996.

(4) Letter from J. P. O'Hanlon (Va. Electric & Power Co.) to USNRC, "Virginia Electric and Power Company, Surry and North Anna Power Stations Units 1 and 2, Report of Emergency Core Cooling System (ECCS) Evaluation Changes Pursuant to the Requirements of 10CFR50.46," Serial No. 97-174, March 27, 1997.

(5) Letter from J. P. O'Hanlon (Va. Electric & Power Co.) to USNRC, "Virginia Electric and Power Company, Surry and North Anna Power Stations Units 1 and 2, Report of Emergency Core Cooling System (ECCS) Evaluation Changes Pursuant to the Requirements of 10CFR50.46," Serial No. 98-303, May 28, 1998.

ATTACHMENT 3

EFFECT OF ECCS EVALUATION MODEL CHANGES

SURRY UNITS 1 AND 2

Effect of Westinghouse ECCS Evaluation Model Changes - Surry

The information provided herein is applicable to Surry Power Station, Units 1 and 2. It is based upon reports from Westinghouse Electric Corporation for issues involving the ECCS evaluation models and plant-specific application of the models in the existing analyses. Peak cladding temperature (PCT) values and margin allocations represent issues for which permanent resolutions have been implemented. The assessments for small break and large break LOCA are presented in Sections A and B, respectively.

Section A - Small Break LOCA Margin Utilization - Surry Units 1 and 2

A. PCT for Analysis of Record (AOR)	1717°F	(1)
B. Prior PCT Assessments Allocated to AOR	**0°F**	
SBLOCA Augmented PCT for AOR	1717°F	
C. PCT Assessments for 10CFR50.46(a)(3)(i) Accumulation {1}	**0°F**	
SBLOCA Licensing Basis PCT (AOR PCT + PCT Assessments)	1717°F	

Section B - Large Break LOCA Margin Utilization - Surry Units 1 and 2

A. PCT for Analysis of Record (AOR)	2120°F	(2)
B. Prior PCT Assessments Allocated to AOR	**-16°F**	
1. ZIRLO™ Cladding	-16°F	
LBLOCA Augmented PCT for AOR	2104°F	
C. PCT Assessments for 10CFR50.46(a)(3)(i) Accumulation {1}	**21°F**	
1. Vessel & SG Calculation Errors in LUCIFER	-6°F	(2)
2. LBLOCA Rod Internal Pressure Issues	0°F	(2)
3. Translation of Fluid Conditions from SATAN to LOCTA	+15°F	(3)
LBLOCA Licensing Basis PCT (AOR PCT + PCT Assessments)	2113°F	

Notes { } and References ( ) on the following page

Effect of Westinghouse ECCS Evaluation Model Changes - Surry

Notes:

{1} The accumulation of changes (sum of absolute magnitudes) is less than 50°F and is not significant, as defined in 10CFR50.46(a)(3)(i).

References:

(1) Letter from W. L. Stewart (Va. Electric & Power Co.) to NRC, "Surry Power Station Units 1 and 2 - Proposed Technical Specifications Changes - FΔH Increase/Statistical DNBR Methodology," Serial No. 91-374, July 8, 1991.

(2) Letter from W. L. Stewart (VEPCO) to Document Control Desk (USNRC), "Virginia Electric and Power Company, Surry Power Station Units 1 and 2, 30-Day Report of ECCS Evaluation Model Changes Per Requirements of 10CFR50.46," Serial No. 94-254, April 27, 1994.

(3) Letter from J. P. O'Hanlon (Va. Electric & Power Co.) to USNRC, "Virginia Electric and Power Company, Surry and North Anna Power Stations Units 1 and 2, Report of Emergency Core Cooling System (ECCS) Evaluation Changes Pursuant to the Requirements of 10CFR50.46," Serial No. 97-174, March 27, 1997.