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

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NL&OS/GDM R1
Docket Nos. 50-305
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DPR-32/37

DOMINION ENERGY KEWAUNEE, INC.
DOMINION NUCLEAR CONNECTICUT, INC.
VIRGINIA ELECTRIC AND POWER COMPANY
KEWAUNEE POWER STATION
MILLSTONE POWER STATION UNITS 2 AND 3
NORTH ANNA POWER STATION UNITS 1 AND 2
SURRY POWER STATION UNITS 1 AND 2
2006 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

In accordance with 10 CFR 50.46(a)(3)(ii), Dominion Energy Kewaunee, Inc. (DEK), Dominion Nuclear Connecticut, Inc. (DNC) and Virginia Electric and Power Company (Dominion) hereby submit the annual summary of permanent changes to the emergency core cooling system (ECCS) evaluation models for Kewaunee Power Station (KPS), Millstone Power Station Units 2 and 3 (MPS 2&3), North Anna Power Station Units 1 and 2 (NAPS 1&2), and Surry Power Station Units 1 and 2 (SPS 1&2), respectively.

Attachment 1 of this letter provides a report describing plant-specific evaluation model changes associated with the Westinghouse and AREVA Small Break Loss of Coolant Accident (SBLOCA) and Large Break Loss of Coolant Accident (LBLOCA) ECCS evaluation models for KPS, MPS 2&3, NAPS 1&2, and SPS 1&2.

Information regarding the effect of the ECCS evaluation model changes upon the reported SBLOCA and LBLOCA analyses of record (AOR) results is provided for KPS, MPS 2&3, NAPS 1&2, and SPS 1&2 in Attachments 2, 3, 4 and 5, respectively. The NAPS 1&2 2006 cores were comprised of both Westinghouse fuel and AREVA fuel. Therefore, there are two sets of margin utilization data for NAPS 1&2. The calculated peak cladding temperatures (PCT) for the SBLOCA and LBLOCA analyses for KPS, MPS 2&3, NAPS 1&2, and SPS 1&2 are summarized below.

Kewaunee – Small break – Westinghouse Evaluation Model:	1065°F
Kewaunee – Large break – Westinghouse Evaluation Model:	2035°F
Millstone Unit 2 - Small break - AREVA Evaluation Model:	1786°F
Millstone Unit 2 - Large break - AREVA Evaluation Model:	1825°F
Millstone Unit 3 - Small break - Westinghouse Evaluation Model:	1009°F
Millstone Unit 3 – Large break - Westinghouse Evaluation Model:	2048°F
North Anna Unit 1 - Small break - Westinghouse Evaluation Model:	1809°F
North Anna Unit 1 - Large break - Westinghouse Evaluation Model:	2086°F
North Anna Unit 1 - Small break - AREVA Evaluation Model:	1380°F
North Anna Unit 1 - Large break - AREVA Evaluation Model:	1974°F
North Anna Unit 2 - Small break - Westinghouse Evaluation Model:	1809°F
North Anna Unit 2 - Large break - Westinghouse Evaluation Model:	2086°F
North Anna Unit 2 - Small break - AREVA Evaluation Model:	1370°F
North Anna Unit 2 - Large break - AREVA Evaluation Model:	1958°F
Surry Units 1 and 2 - Small break - Westinghouse Evaluation Model:	1845°F
Surry Units 1 and 2 - Large break - Westinghouse Evaluation Model:	2194°F

The LOCA results for KPS, MPS 2&3, NAPS 1&2, and SPS 1&2 are confirmed to have sufficient margin to the 2200°F limit for PCT specified in 10 CFR 50.46. Based on the evaluation of this information and the resulting changes in the applicable licensing basis PCT results, no further action is required to demonstrate compliance with the 10 CFR 50.46 requirements.

Regarding Surry's LBLOCA analysis, in a November 16, 2006 letter (Serial No. 06-936) Dominion submitted a revised best estimate LBLOCA analysis using the approved Westinghouse Automated Statistical Treatment of Uncertainty Method (ASTRUM) for NRC approval. Upon approval, this reanalysis will provide improved margin to the 2200°F limit for PCT specified in 10 CFR 50.46.

This information satisfies the 2006 annual reporting requirements of 10 CFR 50.46(a)(3)(ii).

If you have any further questions regarding this submittal, please contact Mr. Gary D. Miller at (804) 273-2771.

Very truly yours,

Gerald T. Bischof
Vice President – Nuclear Engineering

Commitments made in this letter: None

Attachments: (5)

1. Report of Changes in Westinghouse and AREVA ECCS Evaluation Models.
2. 2006 Annual Reporting of 10 CFR 50.46 Margin Utilization - Kewaunee Power Station.
3. 2006 Annual Reporting of 10 CFR 50.46 Margin Utilization - Millstone Power Station Units 2 and 3.
4. 2006 Annual Reporting of 10 CFR 50.46 Margin Utilization – North Anna Power Station Units 1 and 2.
5. 2006 Annual Reporting of 10 CFR 50.46 Margin Utilization – Surry Power Station Units 1 and 2.

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ATTACHMENT 1

2006 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

REPORT OF CHANGES IN WESTINGHOUSE AND AREVA ECCS EVALUATION MODELS

DOMINION ENERGY KEWAUNEE, INC.
DOMINION NUCLEAR CONNECTICUT, INC.
VIRGINIA ELECTRIC AND POWER COMPANY
KEWAUNEE POWER STATION
MILLSTONE POWER STATION UNITS 2 AND 3
NORTH ANNA POWER STATION UNITS 1 AND 2
SURRY POWER STATION UNITS 1 AND 2

REPORT OF CHANGES IN WESTINGHOUSE AND AREVA ECCS EVALUATION MODELS

Generic Westinghouse PCT Assessments with No Impact on PCT

Westinghouse identified the following change applicable to the NOTRUMP Small Break Loss of Coolant Accident (SBLOCA) and BASH Large Break Loss of Coolant Accident (LBLOCA) evaluation models. The change was evaluated to have a PCT impact of 0°F. Since this item has no impact on PCT, it will not be shown on the PCT Margin Utilization sheets provided in Attachments 2 through 5.

a. General Code Maintenance (BASH/NOTRUMP)

Westinghouse identified the following change in the 1999 Westinghouse Best Estimate LBLOCA evaluation model (BE LBLOCA EM) with application to PWRs with upper plenum injection. This evaluation model is utilized at Kewaunee Power Station. The change was evaluated to have a PCT impact of 0°F. Since this item has no impact on PCT, it will not be shown on the PCT Margin Utilization sheet provided in Attachment 2.

a. General Code Maintenance (1999 Westinghouse BE LBLOCA EM, Application to PWRs with Upper Plenum Injection)

The following summarizes the plant specific PCT assessments since the previous annual report.

Kewaunee Power Station

1. During the course of reviewing several extended power uprate and replacement steam generator SBLOCA analyses, the Nuclear Regulatory Commission (NRC) questioned the break spectrum analyzed in the NOTRUMP EM. The NRC was concerned that the resolution of the break spectrum used in the NOTRUMP EM (1.5, 2, 3, 4, and 6 inch cases) may not be fine enough to capture the worst break with regard to limiting PCT as per 10 CFR 50.46. That is, the plant could be SBLOCA limited with regard to overall LOCA results. In response to this, Westinghouse performed some preliminary work indicating that in some cases more limiting results could be obtained from non-integer break sizes; however, the magnitude of the impact was far less than that shown in preliminary work performed by the NRC. Based on this, Westinghouse performed evaluations to determine if all currently operating plants would maintain compliance with the 10 CFR 50.46 acceptance criteria when considering a refined SBLOCA break spectrum.

   For plants with low SBLOCA PCTs (i.e., less than 1700°F) and overall SBLOCA results that are significantly non-limiting when compared with LBLOCA results, no explicit refined break spectrum calculations were performed, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes. Since KPS

falls into this category of plants, the impact on PCT will be tracked as ΔPCT = 0°F.

2. Westinghouse evaluated the following changes and errors in the Westinghouse BE LBLOCA EM for KPS:

	KPS ΔPCT
Inconsistent Vessel Vertical Level Modeling	0°F
Revised Downcomer Gap Inputs	-59°F

These items were previously reported to the NRC in a letter dated September 1, 2006 (Serial No. 06-681) to meet the 30-day reporting requirements of 10 CFR 50.46(a)(3)(ii).

3. Westinghouse identified an error in the calculation of the core support column metal mass which results in a small discrepancy in the total lower plenum heat slab metal mass. This error applies to the KPS 1999 Westinghouse BE LBLOCA EM, with application to PWRs with Upper Plenum Injection. Westinghouse evaluated the corrected metal mass for the core support column for impact on the current LBLOCA licensing basis analysis. The difference in the metal mass is very small and produces a negligible effect on the LBLOCA analysis, leading to an estimated PCT impact of 0°F.

Millstone Power Station Unit 2

1. AREVA, during a review of the vessel model for the S-RELAP5 SBLOCA analysis for MPS2, showed that the upper tie plate (UTP) flow area was not being used in the CCFL model at the core exit. The UTP flow area is the minimum flow area at the top of the core and should be used by the CCFL model to obtain accurate velocities. AREVA corrected the UTP flow area and flow path options in the CCFL model. The updated S-RELAP5 SBLOCA calculation yielded an estimated PCT impact of ΔPCT = -22°F.

2. AREVA, in the process of converting S-RELAP5 to FORTRAN-90, identified deviations in the calculated response. The deviations were traced to the use of array indices in the ICECON computer code that result in interpolations outside of the data table. The error involves the calculation of steam condensation and was essentially undetectable with the F77 compiler. With the F90 compiler and execution, the spurious use of data outside the data table was more noticeable. Investigation of the interpolation error also identified several minor errors associated with calculation of the limits of the steam condensation rate.

The same errors exist in the version of ICECON used in the RFPAC computer code, which is part of the SEM/PWR-98 LBLOCA methodology. AREVA evaluated the PCT impact of these errors to be ΔPCT = 0°F for dry containment plants and determined that this PCT assessment is applicable to the MPS2 LBLOCA analysis.

3. AREVA provided an evaluation to assess the impact on the MPS2 LBLOCA PCT resulting from the containment sump modification and replacement pressurizer at MPS2. The containment sump modification is being made to address the GSI-191 issue. The additional heat structures from the containment sump modification and replacement pressurizer resulted in an increase in the MPS2 LBLOCA results of ΔPCT = 2°F.

Millstone Power Station Unit 3

1. During the course of reviewing several extended power uprate and replacement steam generator SBLOCA analyses, the Nuclear Regulatory Commission (NRC) questioned the break spectrum analyzed in the NOTRUMP EM. The NRC was concerned that the resolution of the break spectrum used in the NOTRUMP EM (1.5, 2, 3, 4, and 6 inch cases) may not be fine enough to capture the worst break with regard to limiting PCT as per 10 CFR 50.46. That is, the plant could be SBLOCA limited with regard to overall LOCA results. In response to this, Westinghouse performed some preliminary work indicating that in some cases more limiting results could be obtained from non-integer break sizes; however, the magnitude of the impact was far less than that shown in preliminary work performed by the NRC. Based on this, Westinghouse performed evaluations to determine if all currently operating plants would maintain compliance with the 10 CFR 50.46 acceptance criteria when considering a refined SBLOCA break spectrum.

   For plants with low SBLOCA PCTs (i.e., less than 1700°F) and overall SBLOCA results that are significantly non-limiting when compared with LBLOCA results, no explicit refined break spectrum calculations were performed, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes. Since MPS3 falls into this category of plants, the impact on PCT, resulting from the NOTRUMP-EM Refined Break Spectrum issue, will be tracked as ΔPCT = 0°F.

2. Westinghouse evaluated the following change in the BASH LBLOCA evaluation model for MPS3:

	MPS3 ΔPCT
BASH Minimum and Maximum Time Step Sizes	44°F

This item was previously reported to the NRC in a letter dated November 20, 2006 (Serial No. 06-981) to meet the 30-day reporting requirements of 10 CFR 50.46 (a)(3)(ii).

3. Westinghouse identified an issue whereby a recent BASH LBLOCA evaluation predicted an increase in PCT for Integral Fuel Burnable Absorber (IFBA) fuel that was attributed primarily to the use of fuel rod initial conditions based on PAD Version 4.0. This result called into question the basis for forward-fit implementation of PAD Version 4.0, and existing IFBA analyses based on PAD Version 3.4 were reviewed to identify conditions that could lead to similar behavior. MPS3 is unaffected by this issue since the MPS3 BASH LBLOCA analysis was evaluated previously using fuel rod initial conditions based on PAD Version 4.0.

4. Westinghouse provided a re-evaluation of a charging pump alternate mini-flow line modification, which was installed during the spring 2007 Refueling Outage (3R11). As a result of the charging pump alternate mini-flow line modification, revised charging/safety injection (CHG/SI) system flows were developed and an evaluation was performed to determine the impact of the revised flows on the current LBLOCA and SBLOCA analyses-of-record (AORs). The revised flows were determined to have a negligible effect on the MPS3 SBLOCA and LBLOCA transients. The CHG/SI Alternate MiniFlow modification will be tracked as a ΔPCT = 0°F impact for both the MPS3 SBLOCA and LBLOCA analyses.

North Anna Power Station Units 1 and 2

1. Westinghouse evaluated the following change in the NOTRUMP SBLOCA evaluation model for North Anna Units 1 and 2:

	NAPS1&2 ΔPCT
NOTRUMP-EM Refined Break Spectrum	85°F

This item was previously reported to the NRC in a letter dated March 22, 2007 (Serial No. 07-0142) to meet the 30-day reporting requirements of 10 CFR 50.46 (a)(3)(ii).

2. Westinghouse reviewed some recent BASH-EM LBLOCA sensitivity calculations, which led to a recommendation to reduce the minimum and maximum time step sizes in BASH during reflood. Sensitivity calculations using BASH and SMUUTH show that reducing the minimum and maximum time step sizes in BASH during reflood results in either a negligible change or a modest increase in the integral flooding rate for most cases, leading to an estimated impact of ΔPCT = 0°F for 10 CFR 50.46 reporting purposes.

3. Westinghouse identified an issue whereby a recent BASH LBLOCA evaluation predicted an increase in PCT for Integral Fuel Burnable Absorber (IFBA) fuel that was attributed primarily to the use of fuel rod initial conditions based on PAD Version 4.0. This result called into question the basis for forward-fit implementation of PAD Version 4.0, and existing IFBA analyses based on PAD Version 3.4 were reviewed to identify conditions that could lead to similar behavior. NAPS 1 & 2 are unaffected by this issue since the NAPS 1 & 2 BASH LBLOCA analyses were evaluated previously using fuel rod initial conditions based on PAD Version 4.0.

4. AREVA did not identify any new changes or errors in the Realistic LBLOCA (RLBLOCA) and SBLOCA analyses that were not previously reported to the NRC in the 2005 Annual 10 CFR 50.46 letter dated June 28, 2006 (Serial No. 06-521).

Surry Power Station Units 1 and 2

1. Westinghouse evaluated the following change in the NOTRUMP SBLOCA evaluation model for Surry Units 1 and 2:

	SPS1&2 ΔPCT
NOTRUMP-EM Refined Break Spectrum	85°F

This item was previously reported to the NRC in a letter dated March 22, 2007 (Serial No. 07-0142) to meet the 30-day reporting requirements of 10 CFR 50.46(a)(3)(ii).

2. Westinghouse reviewed some recent BASH-EM LBLOCA sensitivity calculations, which led to a recommendation to reduce the minimum and maximum time step sizes in BASH during reflood. Sensitivity calculations using BASH and SMUUTH show that reducing the minimum and maximum time step sizes in BASH during reflood results in either a negligible change or a modest increase in the integral flooding rate for most cases, leading to an estimated impact of ΔPCT = 0°F for 10 CFR 50.46 reporting purposes.

3. Westinghouse identified an issue whereby a recent BASH LBLOCA evaluation predicted an increase in PCT for Integral Fuel Burnable Absorber (IFBA) fuel that was attributed primarily to the use of fuel rod initial conditions based on PAD Version 4.0. This result called into question the basis for forward-fit implementation of PAD Version 4.0, and existing IFBA analyses based on PAD Version 3.4 were reviewed to identify conditions that could lead to similar behavior. SPS 1 & 2 are unaffected by this issue since the SPS 1 & 2 BASH LBLOCA analyses were evaluated previously using fuel rod initial conditions based on PAD Version 4.0.

Conclusion

The LOCA results for KPS, MPS 2&3, NAPS 1&2, and SPS 1&2 are confirmed to have sufficient margin to the 2200°F limit for PCT specified in 10 CFR 50.46. Based on the evaluation of this information and the resulting changes in the applicable licensing basis PCT results, no further action is required to demonstrate compliance with the 10 CFR 50.46 requirements. Reporting of this information is required per 10 CFR 50.46(a)(3)(ii), which obligates each licensee to report the effect upon calculated temperature of any change or error in evaluation models or their application on an annual basis.

This information satisfies the 2006 annual reporting requirements of 10 CFR 50.46(a)(3)(ii).

ATTACHMENT 2

2006 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

2006 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION

10 CFR 50.46 MARGIN UTILIZATION - SMALL BREAK LOCA

Plant Name:	Kewaunee Power Station
Utility Name:	Dominion Energy Kewaunee, Inc.

Analysis Information

EM:	NOTRUMP	**Limiting Break Size:**	3 Inch CL, High Tav
Analysis Date:	05/14/02		
Vendor:	Westinghouse		
FQ:	2.5	**FdH:**	1.8
Fuel:	422 Vantage +	**SGTP(%):**	10
Notes:	Uprate to 1772 MWt. Effective beginning Cycle 26		

	Clad Temp (°F)
LICENSING BASIS	
Analysis of Record PCT	1030
PCT ASSESSMENTS (Delta PCT)	
A. Prior ECCS Model Assessments	
1. NOTRUMP Bubble Rise/Drift Flux Model Inconsistency Corrections	35
B. Planned Plant Modification Evaluations	
1. None	0
C. 2006 ECCS Model Assessments	
1. NOTRUMP-EM Refined Break Spectrum	0
D. Other	
1. None	0
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT = 1065**

10 CFR 50.46 MARGIN UTILIZATION - LARGE BREAK LOCA

Plant Name:	Kewaunee Power Station		
Utility Name:	Dominion Energy Kewaunee, Inc.		
Analysis Information			
EM:	UPI (1999)	**Limiting Break Size:**	Split
Analysis Date:	03/25/02		
Vendor:	Westinghouse		
FQ:	2.5	**FdH:**	1.8
Fuel:	422 Vantage +	**SGTP(%):**	10
Notes:	Uprate to 1772 MWt. Effective beginning Cycle 26		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	2084
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	Revised Blowdown Heatup Uncertainty Distribution	5
2.	Spacer Grid Heat Transfer Model Inputs	5
B.	**Planned Plant Modification Evaluations**	
1.	None	0
C.	**2006 ECCS Model Assessments**	
1.	Inconsistent Vessel Vertical Level Modeling	0
2.	Revised Downcomer Gap Inputs	-59
3.	Core Support Column Heat Slab Discrepancy	0
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 2035**

ATTACHMENT 3

2006 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

2006 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNITS 2 AND 3

10 CFR 50.46 MARGIN UTILIZATION - SMALL BREAK LOCA

Plant Name: Millstone Power Station, Unit 2
Utility Name: Dominion Nuclear Connecticut, Inc.

Analysis Information

EM: PWR Small Break LOCA, S-RELAP5 Based **Limiting Break Size:** 0.08 ft^2
Analysis Date: 01/02
Vendor: AREVA
Peak Linear Power: 15.1 kW/ft
Notes: None

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1941
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	Decay Heat Model Error	-133
2.	Revised SBLOCA Guideline	0
B.	**Planned Plant Modification Evaluations**	
1.	None	0
C.	**2006 ECCS Model Assessments**	
1.	Core Exit Modeling-Upper Tie Plate Flow Area	-22
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 1786**

10 CFR 50.46 MARGIN UTILIZATION - LARGE BREAK LOCA

Plant Name: Millstone Power Station, Unit 2
Utility Name: Dominion Nuclear Connecticut, Inc.

Analysis Information

EM:	SEM/PWR-98	**Limiting Break Size:**	1.0 DECLG
Analysis Date:	11/98		
Vendor:	AREVA		
Peak Linear Power:	15.1 kW/ft		
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1814
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	Corrected Corrosion Enhancement Factor	-1
2.	ICECON Coding Errors	0
3.	Setting RFPAC Fuel Temperatures at Start of Reflood	-2
4.	SISPNCH/ujun98 Code Error	0
5.	Error in Flow Blockage Model in TOODEE2	0
6.	Change in TOODEE2-Calculation of QMAX	0
7.	Change in Gadolinia Modeling	0
8.	PWR LBLOCA Split Break Modeling	0
9.	TEOBY Calculation Error	0
10.	Inappropriate Heat Transfer in TOODEE2	0
11.	End-of-Bypass Prediction by TEOBY	0
12.	R4SS Overwrite of Junction Inertia	0
13.	Incorrect Junction Inertia Multipliers	1
14.	Errors Discovered During RODEX2 V&V	0
15.	Error in Broken Loop SG Tube Exit Junction Inertia	0
16.	RFPAC Refill and Reflood Calculation Code Errors	16
17.	Incorrect Pump Junction Area Used in RELAP4	0
18.	Error in TOODEE2 Clad Thermal Expansion	-1
19.	Accumulator Line Loss Error	-1
20.	Inconsistent Loss Coefficients Used for Robinson LBLOCA	0
21.	Pump Head Adjustment for Pressure Balance Initialization	-3
B.	**Planned Plant Modification Evaluations**	
1.	Containment Sump Modification and Replacement PZR	2
C.	**2006 ECCS Model Assessments**	
1.	ICECON Code Errors	0
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =**	**1825**

10 CFR 50.46 MARGIN UTILIZATION - SMALL BREAK LOCA

Plant Name:	Millstone Power Station, Unit 3		
Utility Name:	Dominion Nuclear Connecticut, Inc.		
Analysis Information			
EM:	NOTRUMP	**Limiting Break Size:**	3 Inches
Analysis Date:	04/04		
Vendor:	Westinghouse		
FQ:	2.6	**FΔH:**	1.7
Fuel:	RFA/Vantage 5H	**SGTP (%):**	10
Notes:	None		

	Clad Temp (°F)
LICENSING BASIS	
Analysis of Record PCT	1009
PCT ASSESSMENTS (Delta PCT)	
A. Prior ECCS Model Assessments	
1. NOTRUMP Bubble Rise / Drift Flux Model Inconsistency Corrections	0
B. Planned Plant Modification Evaluations	
1. CHG/SI Alternate MiniFlow	0
C. 2006 ECCS Model Assessments	
1. NOTRUMP-EM Refined Break Spectrum	0
D. Other	
1. None	0
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT = 1009**

10 CFR 50.46 MARGIN UTILIZATION - LARGE BREAK LOCA

Plant Name:	Millstone Power Station, Unit 3		
Utility Name:	Dominion Nuclear Connecticut, Inc.		
Analysis Information			
EM:	BASH	**Limiting Break Size:**	Cd=0.6
Analysis Date:	08/90		
Vendor:	Westinghouse		
FQ:	2.6	**FΔH:**	1.7
Fuel:	Vantage 5H	**SGTP (%):**	10
Notes:	VH5/RFA		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1974
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	None	0
B.	**Planned Plant Modification Evaluations**	
1.	CHG/SI Alternate MiniFlow	0
C.	**2006 ECCS Model Assessments**	
1.	BASH Minimum and Maximum Time Step Sizes	44
D.	**Other**	
1.	Rebaseline of AOR	30
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 2048**

ATTACHMENT 4

2006 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

2006 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE SMALL BREAK LOCA

Plant Name:	North Anna Power Station, Unit 1
Utility Name:	Virginia Electric and Power Company

Analysis Information

EM:	NOTRUMP	**Limiting Break Size:**	3 Inches
Analysis Date:	1995		
Vendor:	Westinghouse		
FQ:	2.32	**FΔH:**	1.65
Fuel:	NAIF	**SGTP (%):**	7
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1704
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	NOTRUMP Specific Enthalpy Error	20
2.	SALIBRARY Double Precision Error	-15
3.	Fuel Rod Initialization Error	10
4.	Loop Seal Elevation Error	-44
5.	NOTRUMP-Mixture Level Tracking Errors	13
6.	Removal of Part Length CRDMs	1
7.	NOTRUMP-Bubble Rise/Drift Flux Model Inconsistencies	35
B.	**Planned Plant Modification Evaluations**	
1.	None	0
C.	**2006 ECCS Model Assessments**	
1.	NOTRUMP-EM Refined Break Spectrum	85
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 1809**

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE LARGE BREAK LOCA

Plant Name:	North Anna Power Station, Unit 1		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	BASH	**Limiting Break Size:**	Cd=0.4
Analysis Date:	2004		
Vendor:	Westinghouse		
FQ:	2.19	**FΔH:**	1.55
Fuel:	NAIF	**SGTP (%):**	7
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	2086
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	LOCBART Fluid Property Logic Issue	0
B.	**Planned Plant Modification Evaluations**	
1.	None	0
C.	**2006 ECCS Model Assessments**	
1.	BASH Minimum and Maximum Time Step Sizes	0
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 2086**

10 CFR 50.46 MARGIN UTILIZATION – AREVA SMALL BREAK LOCA

Plant Name:	North Anna Power Station, Unit 1		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	AREVA SB EM	**Limiting Break Size:**	5.2 Inches (SI Line)
Analysis Date:	2004		
Vendor:	AREVA		
FQ:	2.32	**FΔH:**	1.65
Fuel:	Advanced Mark-BW	**SGTP (%):**	7
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1404
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	None	0
B.	**Planned Plant Modification Evaluations**	
1.	Revised Test Flow Curve for HHSI	-24
C.	**2006 ECCS Model Assessments**	
1.	None	0
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 1380**

10 CFR 50.46 MARGIN UTILIZATION – AREVA LARGE BREAK LOCA

Plant Name:	North Anna Power Station, Unit 1		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	AREVA RLBLOCA EM	**Limiting Break Size:**	DEGB
Analysis Date:	2004		
Vendor:	AREVA		
FQ:	2.32	**FΔH:**	1.65
Fuel:	Mixed Advanced Mark-BW	**SGTP (%):**	12
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1853
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	Forslund-Rohsenow Correlation Modeling	64
2.	RWST Temperature Assumption	8
3.	LBLOCA/Seismic SG Tube Collapse	0
4.	RLBLOCA Choked Flow Disposition	-26
5.	RLBLOCA Changes in Uncertainty Parameters	10
B.	**Planned Plant Modification Evaluations**	
1.	Advanced Mark-BW Top Nozzle Modification	65
C.	**2006 ECCS Model Assessments**	
1.	None	0
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 1974**

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE SMALL BREAK LOCA

Plant Name:	North Anna Power Station, Unit 2		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	NOTRUMP	**Limiting Break Size:**	3 Inches
Analysis Date:	1995		
Vendor:	Westinghouse		
FQ:	2.32	**FΔH:**	1.65
Fuel:	NAIF	**SGTP (%):**	7
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1704
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	NOTRUMP Specific Enthalpy Error	20
2.	SALIBRARY Double Precision Error	-15
3.	Fuel Rod Initialization Error	10
4.	Loop Seal Elevation Error	-44
5.	Removal of Part Length CRDMs	1
6.	NOTRUMP-Mixture Level Tracking Errors	13
7.	NOTRUMP-Bubble Rise/Drift Flux Model Inconsistencies	35
B.	**Planned Plant Modification Evaluations**	
1.	None	0
C.	**2006 ECCS Model Assessments**	
1.	NOTRUMP-EM Refined Break Spectrum	85
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 1809**

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE LARGE BREAK LOCA

Plant Name:	North Anna Power Station, Unit 2
Utility Name:	Virginia Electric and Power Company

Analysis Information

EM:	BASH	**Limiting Break Size:**	Cd=0.4
Analysis Date:	2004		
Vendor:	Westinghouse		
FQ:	2.19	**FΔH:**	1.55
Fuel:	NAIF	**SGTP (%):**	7
Notes:	None		

	Clad Temp (°F)
LICENSING BASIS	
Analysis of Record PCT	2086
PCT ASSESSMENTS (Delta PCT)	
A. Prior ECCS Model Assessments	
1. LOCBART Fluid Property Logic Issue	0
B. Planned Plant Modification Evaluations	
1. None	0
C. 2006 ECCS Model Assessments	
1. BASH Minimum and Maximum Time Step Sizes	0
D. Other	
1. None	0
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT = 2086**

10 CFR 50.46 MARGIN UTILIZATION – AREVA SMALL BREAK LOCA

Plant Name:	North Anna Power Station, Unit 2		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	AREVA SB EM	**Limiting Break Size:**	3 Inches
Analysis Date:	2004		
Vendor:	AREVA		
FQ:	2.32	**FΔH:**	1.65
Fuel:	Advanced Mark-BW	**SGTP (%):**	7
Notes:	None		

	Clad Temp (°F)
LICENSING BASIS	
Analysis of Record PCT	1370
PCT ASSESSMENTS (Delta PCT)	
A. Prior ECCS Model Assessments	
1. None	0
B. Planned Plant Modification Evaluations	
1. None	0
C. 2006 ECCS Model Assessments	
1. None	0
D. Other	
1. None	0
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT = 1370**

10 CFR 50.46 MARGIN UTILIZATION – AREVA LARGE BREAK LOCA

Plant Name:	North Anna Power Station, Unit 2		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	AREVA RLBLOCA EM	**Limiting Break Size:**	DEGB
Analysis Date:	2004		
Vendor:	AREVA		
FQ:	2.32	**FΔH:**	1.65
Fuel:	Mixed: Advanced Mark-BW	**SGTP (%):**	12
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1789
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	Forslund-Rohsenow Correlation Modeling	64
2.	RWST Temperature Assumption	8
3.	LBLOCA/Seismic SG Tube Collapse	0
4.	RLBLOCA Choked Flow Disposition	22
5.	RLBLOCA Changes in Uncertainty Parameters	10
B.	**Planned Plant Modification Evaluations**	
1.	Advanced Mark-BW Top Nozzle Modification	65
C.	**2006 ECCS Model Assessments**	
1.	None	0
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 1958**

ATTACHMENT 5

2006 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

2006 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE SMALL BREAK LOCA

Plant Name:	Surry Power Station, Unit 1
Utility Name:	Virginia Electric and Power Company

Analysis Information

EM:	NOTRUMP	**Limiting Break Size:**	3 Inches
Analysis Date:	1996		
Vendor:	Westinghouse		
FQ:	2.5	**FΔH:**	1.7
Fuel:	SIF	**SGTP (%):**	15
Notes:	None		

	Clad Temp (°F)
LICENSING BASIS	
Analysis of Record PCT	1717
PCT ASSESSMENTS (Delta PCT)	
A. Prior ECCS Model Assessments	
1. NOTRUMP - Mixture Level Tracking Errors	13
2. Removal of Part Length CRDMs	-15
3. NOTRUMP-Bubble Rise/Drift Flux Model Inconsistencies	35
B. Planned Plant Modification Evaluations	
1. Westinghouse IFBA Fuel Product Implementation	10
C. 2006 ECCS Model Assessments	
1. NOTRUMP-EM Refined Break Spectrum	85
D. Other	
1. None	0
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT = 1845**

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE LARGE BREAK LOCA

Plant Name:	Surry Power Station, Unit 1		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	BASH	**Limiting Break Size:**	Cd=0.4
Analysis Date:	2001		
Vendor:	Westinghouse		
FQ:	2.32	**FΔH:**	1.62
Fuel:	SIF	**SGTP (%):**	15
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	2117
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	LBLOCA/Seismic SG Tube Collapse	0
2.	BASH-EM Transient Termination	0
3.	LOCBART Fluid Property Logic Issue	10
4.	LOCBART ZIRLO™ Cladding Specific Heat Model Error	16
5.	PAD 4.0 Initial Pellet Temperatures	-11
6.	Removal of Part-Length CRDMs	-66
7.	Pressurizer Surge Line Piping Schedule Reconciliation	8
8.	LOCBART Fluid Property Logic Issue-Augmented	10
9.	Revised Containment Heat Sink Input	113
10.	Revised Containment Spray Flowrate	-17
11.	Revised Containment Free Volume	-17
12.	LOCBART Fluid Property Logic Issue-Augmented	-10
B.	**Planned Plant Modification Evaluations**	
1.	Westinghouse IFBA Fuel Product Implementation	41
C.	**2006 ECCS Model Assessments**	
1.	BASH Minimum and Maximum Time Step Sizes	0
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 2194**

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE SMALL BREAK LOCA

Plant Name:	Surry Power Station, Unit 2		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	NOTRUMP	**Limiting Break Size:**	3 Inches
Analysis Date:	1996		
Vendor:	Westinghouse		
FQ:	2.5	**FΔH:**	1.7
Fuel:	SIF	**SGTP (%):**	15
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	1717
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	NOTRUMP - Mixture Level Tracking Errors	13
2.	Removal of Part Length CRDMs	-15
3.	NOTRUMP-Bubble Rise/Drift Flux Model Inconsistencies	35
B.	**Planned Plant Modification Evaluations**	
1.	Westinghouse IFBA Fuel Product Implementation	10
C.	**2006 ECCS Model Assessments**	
1.	NOTRUMP-EM Refined Break Spectrum	85
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 1845**

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE LARGE BREAK LOCA

Plant Name:	Surry Power Station, Unit 2		
Utility Name:	Virginia Electric and Power Company		
Analysis Information			
EM:	BASH	**Limiting Break Size:**	Cd=0.4
Analysis Date:	2001		
Vendor:	Westinghouse		
FQ:	2.32	**FΔH:**	1.62
Fuel:	SIF	**SGTP (%):**	15
Notes:	None		

		Clad Temp (°F)
LICENSING BASIS		
	Analysis of Record PCT	2117
PCT ASSESSMENTS (Delta PCT)		
A.	**Prior ECCS Model Assessments**	
1.	LBLOCA/Seismic SG Tube Collapse	0
2.	BASH-EM Transient Termination	0
3.	LOCBART Fluid Property Logic Issue	10
4.	LOCBART ZIRLO™ Cladding Specific Heat Model Error	16
5.	PAD 4.0 Initial Pellet Temperatures	-11
6.	Removal of Part-Length CRDMs	-66
7.	Pressurizer Surge Line Piping Schedule Reconciliation	8
8.	LOCBART Fluid Property Logic Issue-Augmented	10
9.	Revised Containment Heat Sink Input	113
10.	Revised Containment Spray Flowrate	-17
11.	Revised Containment Free Volume	-17
12.	LOCBART Fluid Property Logic Issue-Augmented	-10
B.	**Planned Plant Modification Evaluations**	
1.	Westinghouse IFBA Fuel Product Implementation	41
C.	**2006 ECCS Model Assessments**	
1.	BASH Minimum and Maximum Time Step Sizes	0
D.	**Other**	
1.	None	0
LICENSING BASIS PCT + PCT ASSESSMENTS		**PCT = 2194**