

June 28, 2007

U.S. Nuclear Regulatory Commission	Serial No.	07-0464
Attention: Document Control Desk	NL&OS/GDM	R1
Washington, DC 20555	Docket Nos.	50-305
		50-336/423
		50-338/339
		50-280/281
	License Nos.	DPR-43
		DPR-65/NPF-49
		NPF-4/7
		DPR-32/37
DOMINION ENERGY KEWAUNEE, INC.		
DOMINION NUCLEAR CONNECTICUT, 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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Mr. R. A. Jervey NRC Project Manager – North Anna Power Station U. S. Nuclear Regulatory Commission One White Flint North 11555 Rockville Pike Mail Stop 08G9A Rockville, Maryland 20852 **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 \triangle PCT = 0°F.

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

	KPS
	ΔΡCΤ
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 \triangle PCT = -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 \triangle PCT = 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 Δ PCT = 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 $\triangle PCT = 0°F$.

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

	MPS3
	∆PCT
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 △PCT = 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
	∆PCT
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 Δ PCT = 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
	∆PCT
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 $\triangle PCT = 0^{\circ}F$ 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).

Serial Number 07-0464 Docket No. 50-305

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			
Analysis Informati	on			
EM: Analysis Date:	NOTRUMP Limiting Break Size: 3 In 05/14/02	ch CL, High Tav		
vendor:				
FQ: Fuel	2.0 FGT: 1.0			
ruel.	422 Valuage + SGIF(%). 10	vela 26		
	Oprate to 1772 WW. Enective beginning Cy			
	<u>.</u>	ad remp ("F)		
Analysis of F	Record PCT	1030		
PCT ASSESSMEN	TS (Delta PCT)			
A. Prior ECCS 1. NOTI Corre	Model Assessments RUMP Bubble Rise/Drift Flux Model Inconsister actions	ncy 35		
B. Planned Pla 1. None	Int Modification Evaluations	0		
C. 2006 ECCS 1. NOT	Model Assessments RUMP-EM Refined Break Spectrum	0		
D. Other 1. None		0		
LICENSING BASIS	PCT + PCT ASSESSMENTS F	PCT = 1065		

10 CFF	8 50.46 MARGIN UT	LIZATION - LA	RGE BREAK	LOCA	
Plant Name:	Kewaunee Power Station				
Utility Name:	Dominion Energy Kewaunee, Inc.				
Analysis Information	on	<u> </u>			
EM:	UPI (1999)	Limiting Break	<pre>Size:</pre>	Split	
Analysis Date:	03/25/02	-		·	
Vendor:	Westinghouse				
FQ:	2.5	FdH: 1	.8		
Fuel:	422 Vantage +	SGTP(%): 1	0		
Notes:	Uprate to 1772 MW	t. Effective begi	nning Cycle	26	
			Clad	Temp (°F)	
LICENSING BASIS					
Analysis of R	ecord PCT			2084	
PCT ASSESSMEN	TS (Delta PCT)				
A. Prior ECCS	Model Assessments	3			
1. Revise	ed Blowdown Heatup	Uncertainty Dis	tribution	5	
2. Space	er Grid Heat Transfer	Model Inputs		5	
B. Planned Pla	nt Modification Eval	luations			
1. None				0	
	Madal Assessments				
	viouel Assessment	5 al Loval Madalin		0	
	od Downoomer Cond		ig	50	
$\frac{2}{3} Core $	eu Downcomer Gap i Support Column Hoo	npuis t Slab Disaranar	201	-59	
J. COLE	Support Column rea	t Slab Discrepar	icy	U	
D. Other					
1. None				0	
LICENSING BASIS	PCT + PCT ASSES	SMENTS	PCT	= 2035	

Serial Number 07-0464 Docket Nos. 50-336/423

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 Informati	on	â
EM:	PWR Small Break LOCA, Limiting Brea	ak Size: 0.08 ft^2
	S-RELAP5 Based	
Analysis Date:	01/02	
Vendor:	AREVA	
Peak Linear Powe	r: 15.1 kW/ft	
Notes:	None	
		<u>Clad Temp (°F)</u>
LICENSING BASIS		
Analysis of H	Record PC1	1941
PCT ASSESSMEN	TS (Delta PCT)	
A. Prior ECCS	Model Assessments	
1. Decay	y Heat Model Error	-133
2. Revis	ed SBLOCA Guideline	0
B. Planned Pla	nt Modification Evaluations	
1. None		0
	Madal Assessments	
1 Core	Wodel Assessments Exit Modeling Upper Tie Plate Elew Area	22
1. Cole	Exit modeling-opper the Flate Flow Alea	-22
D. Other		
1. None		0
LICENSING BASIS	PCT + PCT ASSESSMENTS	PCT = 1786

10 CFR 50.46 MARGIN UTILIZATION - LARGE BREAK LOCA

LICEN	ISING BASIS	PCT + PCT ASSESS	MENTS PCT =	1825	
,,	1. None			0	
D.	Other				
	1. ICECO	ON Code Errors		0	
C.	2006 ECCS	Model Assessments			
	1. Conta	inment Sump Modificat	ion and Replacement PZR	2	
В.	Planned Pla	nt Modification Evalua	ations		
	21. Pump	Head Adjustment for P	ressure Balance Initialization	-3	
	20. Incons	sistent Loss Coefficients	s Used for Robinson LBLOCA	0	
	19. Accun	nulator Line Loss Error		-1	
	18. Error i	n TOODEE2 Clad The	mal Expansion	-1	
	17. Incorre	ect Pump Junction Area	a Used in RELAP4	0	
	16. RFPA	C Refill and Reflood Ca	alculation Code Errors	16	
	15. Error i	n Broken Loop SG Tub	e Exit Junction Inertia	0	
	14. Errors	Discovered During RO	DEX2 V&V	0	
	13. Incorre	ect Junction Inertia Mul	tipliers	1	
	12. R4SS	Overwrite of Junction I	nertia	0	
	11. End-o	f-Bypass Prediction by	TEOBY	0	
	10. Inappr	opriate Heat Transfer i	n TOODEE2	0	
	9. TEOB	Y Calculation Error		0	
	8. PWR	LBLOCA Split Break M	odeling	0	
	7. Chang	je in Gadolinia Modelin	g	0	
	6. Chang	e in TOODEE2-Calcula	ation of QMAX	0	
	5. Error i	n Flow Blockage Model	in TOODEE2	0	
	4. SISPN	ICH/ujun98 Code Error		0	
	3. Setting	g RFPAC Fuel Tempera	atures at Start of Reflood	-2	
	2. ICECO	ON Coding Errors		0	
	1. Correc	ted Corrosion Enhance	ement Factor	-1	
Α.	Prior ECCS	Model Assessments			
PCT A	SSESSMEN	ΓS (Delta PCT)			
	Analysis of R	ecord PCT		1814	
LICEN	SING BASIS				
			<u>Clad Tem</u>	<u>p (°F)</u>	
Notes:		None			
Peak L	inear Power.	: 15.1 kW/ft			
Vendo	r:	AREVA			
Analys	sis Date:	11/98			
EM:		SEM/PWR-98	Limiting Break Size:	1.0 DECLG	
Analys	sis Informatio	<u>on</u>			
	Name:	Dominion Nuclear Con			
Plant	Plant Name: Millstone Power Station, Unit 2				
	•				

	10 CFR 50.46 MARGIN UTILIZATION - SMALL BREAK LOCA						
Plant	Name:	Millstone Power Stat	Millstone Power Station, Unit 3				
Utility	Name:	Dominion Nuclear Connecticut, Inc.					
Analys	sis Inforr	nation					
EM:		NOTRUMP	Limiting Brea	k Size:	3 Inches		
Analys	sis Date:	04/04	-				
Vendo	or:	Westinghouse					
FQ:		2.6	F∆H:	1.7			
Fuel:		RFA/Vantage 5H	SGTP (%):	10			
Notes	•	None					
				Clad T	Temp (°F)		
LICEN	ISING BA	ASIS					
	Analysis	of Record PCT			1009		
PCT A	SSESS	IENTS (Delta PCT)					
Α.	Prior EC	CS Model Assessments	i				
	1. N	OTRUMP Bubble Rise / D	rift Flux Model		_		
	In	consistency Corrections			0		
-							
В.	Planned	Plant Modification Eval	uations		0		
	1. C	HG/SI Alternate MiniFlow			0		
~	2000 50						
с .	2006 EU		i A als On a atmos		0		
	I. N	OTRUMP-EM Refined Bre	eak Spectrum		0		
П	Othor						
D .	1 N	ope			0		
	1. IN				0		
LICEN	LICENSING BASIS PCT + PCT ASSESSMENTS PCT = 1009						
LICEN	NSING BA	ASIS PUT + PUT ASSESS	SMENTS	PCT	= 1009		

	10 CFR 50.46 MARGIN UTILIZATION - LARGE BREAK LOCA						
Plant	Name:	Millstone Power Station	Millstone Power Station, Unit 3				
Utility	Name:	Dominion Nuclear Co	Dominion Nuclear Connecticut, Inc.				
Analy	sis Info	rmation					
EM:		BASH	Limiting Brea	k Size:	Cd=0.6		
Analy	sis Date	e: 08/90					
Vendo	or:	Westinghouse					
FQ:		2.6	F∆H:	1.7			
Fuel:		Vantage 5H	SGTP (%):	10			
Notes	5:	VH5/RFA					
				Clad	Temp (°F)		
LICEN	NSING E	BASIS					
	Analysi	s of Record PCT			1974		
PCT A	ASSESS	MENTS (Delta PCT)					
Α.	Prior E	CCS Model Assessments					
	1.	None			0		
_							
В.	Planne	d Plant Modification Evalu	uations		-		
	1.	CHG/SI Alternate MiniFlow			0		
~	0000 5						
C.	2006 E						
	ι.	BASH Minimum and Maxim	um time Step Si	zes	44		
D	Othor						
<i>D</i> .		Pobasoling of AOP			20		
	ι.				30		

Serial Number 07-0464 Docket Nos. 50-338/339

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

Plant Name:	North Anna Power	Station, Unit 1				
Utility Name:	Virginia Electric and Power Company					
Analysis Informa	ation					
EM:	NOTRUMP	Limiting Brea	k Size:	3 Inches		
Analysis Date:	1995					
Vendor:	Westinghouse					
FQ:	2.32	F∆H:	1.65			
Fuel:	NAIF	SGTP (%):	7			

Notes: None LICENSING BASIS Clad Temp (°F) Analysis of Record PCT 1704 PCT ASSESSMENTS (Delta PCT) 1704 A. Prior ECCS Model Assessments 1. NOTRUMP Specific Enthalpy Error 20
LICENSING BASIS Analysis of Record PCT 1704 PCT ASSESSMENTS (Delta PCT) A. Prior ECCS Model Assessments 1. NOTRUMP Specific Enthalpy Error 20
Analysis of Record PCT 1704 PCT ASSESSMENTS (Delta PCT) 1704 A. Prior ECCS Model Assessments 1. NOTRUMP Specific Enthalpy Error 20
PCT ASSESSMENTS (Delta PCT) A. Prior ECCS Model Assessments 1. NOTRUMP Specific Enthalpy Error 20
A. Prior ECCS Model Assessments 1. NOTRUMP Specific Enthalpy Error 20
1.NOTRUMP Specific Enthalpy Error20
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	
		1000	

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE LARGE BREAK LOCA

Plant Name:North Anna Power Station, Unit 1Utility Name:Virginia Electric and Power Company							
Analy	sis Info	rmation					
EM:		BASH	Limiting Break Si		d=0.4		
Analys	sis Dat	e: 2004					
Vendo	or:	Westinghouse					
FQ:		2.19	F∆H:	1.55			
Fuel:		NAIF	SGTP (%):	7			
Notes	;	None					
				Clad Te	emp (°F)		
LICEN	Analys	SASIS s of Record PCT			2086		
PCT A A.	ASSESS Prior E 1.	MENTS (Delta PCT) CCS Model Assessments LOCBART Fluid Property Log	gic Issue		0		
В.	Planne 1.	d Plant Modification Evalu None	ations		0		
C.	2006 E 1.	CCS Model Assessments BASH Minimum and Maximu	m Time Step Size	S	0		
D.	Other 1.	None			0		
LICENSING BASIS PCT + PCT ASSESSMENTS PCT = 2086							

	10 CI	FR 50.	46 MARGIN UTILIZATI	ON – AREVA S	SMALL E	REAK LOCA
Plant Name: North Anna Power Station, Unit 1						
Utility	<mark>v Name</mark>	:	Virginia Electric and Po	ower Company		
<u>Analy</u>	sis Infe	ormati	<u>on</u>			
EM:			AREVA SB EM	Limiting Brea	ak Size:	5.2 Inches (SI Line)
Analysis Date:		te:	2004			
Vendo	or:		AREVA			
FQ:			2.32	F∆H:	1.65	
Fuel:			Advanced Mark-BW	SGTP (%):	7	
Notes			None			
					<u>Clad</u>	<u> Temp (°F)</u>
LICEN	ISING	BASIS				
	Analys	sis of F	Record PCT			1404
DOT 4		OBACAR				
	199599	SMEN	IS (Delta PCI)			
А.		ECC3	Model Assessments			0
	1.	none				0
R	Dlann	od Dia	ent Modification Evalue	ations		
υ.	1	Revis	ed Test Flow Curve for	HHSI		-24
	••	110110				~ 7
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 Utility	Name: Name:	Noi : Virç	rth Anna Pow ginia Electric a	er Stati and Pov	on, Unit 1 wer Compa	ny				
Analys	sis Info	ormation								
EM:		AR	EVA RLBLOO	CA EM	Limiting B	reak S	ize: I	DEG	BB	
Analys	sis Dat	t e: 200)4		-					
Vendo	or:	AR	EVA							
FQ:		2.3	2		F∆H:	1	.65			
Fuel:		Mix	æd		SGTP (%):	1	2			
		Adv	vanced Mark-	BW	. ,					
Notes	:	Noi	ne							
							Clad 1	Геm	p (°F)	
LICEN	Analys	BASIS sis of Reco	rd PCT						1853	
PCT A	SSES	SMENTS (Delta PCT)							
Α.	Prior E	ECCS Mod	del Assessm	ents						
	1.	Forslund-I	Rohsenow Co	orrelatio	n Modelina				64	
	2.	RWST Te	mperature As	sumpti	on				8	
	3.	LBLOCA/	Seismic SG T	ube Co	llapse				Ō	
	4.	RLBLOCA	A Choked Flov	w Dispo	sition				-26	
	5.	RLBLOCA	A Changes in	Uncerta	ainty Param	eters			10	
B.	Planne	ed Plant N	Indification I	Fvaluat	ions					
	1.	Advanced	Mark-BW To	p Nozz	le Modificat	tion			65	
C.	2006 F	ECCS Mod	lel Assessmi	ents						
	1.	None							0	
D.	Other									
2.	1.	None							0	
LICEN	ISING	BASIS PC	T + PCT ASS	ESSMI	ENTS		PCT	=	1974	

10 0	CFR 50.4	6 MARGIN UTILIZATION -	WESTINGHOUS	SE SMALL E	BREAK LOCA
Plant	Name:	North Anna Power Sta	tion, Unit 2		
Utility	Name:	Virginia Electric and P	ower Company		
Analy	sis Infoi	mation			
EM:		NOTRUMP	Limiting Break	Size: 3 Ind	ches
Analysis Date:		: 1995			
Vendo	or:	Westinghouse			
FQ:		2.32	F∆H:	1.65	
Fuel:		NAIF	SGTP (%):	7	
Notes	;	None			
				Clad Tem	p (°F)
LICEN	ISING B	ASIS			
	Analysi	s of Record PCT			1704
PCT A	ASSESS	MENTS (Delta PCT)			
А.	Prior E	CCS Model Assessments	_		
	1. N	NOTRUMP Specific Enthalpy	/ Error		20
	2.	SALIBRARY Double Precisio	n Error		-15
	3. F	Fuel Rod Initialization Error			10
	4. L	oop Seal Elevation Error			-44
	5. ł	Removal of Part Length CRL	Ms		1
	6. ľ	NOTRUMP-Mixture Level Tra	acking Errors		13
	7. ľ	NOTRUMP-Bubble Rise/Drift	Flux Model Inco	nsistencies	35
-	D I		- 41		
в.	Planne	d Plant Modification Evalu	ations		•
	1. ľ	None			0
C	2006 E	CCS Model Assessments			
0.	1	NOTRUMP-FM Refined Brea	ak Spectrum		85
	•• •				00
D.	Other				
	1. 1	None			0
LICE	NSING E	ASIS PCT + PCT ASSESS	MENTS	PCT =	1809

<u> 10 (</u>	<u>CFR 50.4</u>	46 MARGIN UTILIZATIC	<u> N – WESTINGHOU</u>	SE LAR	GE BREAK	
Plant	Name:	North Anna Power	r Station, Unit 2			
Utility	Name:	Virginia Electric ar	nd Power Company			
Analy	sis Info	rmation				
EM:		BASH	Limiting Brea	k Size:	Cd=0.4	
Analy	sis Date	e: 2004				
Vendo	or:	Westinghouse				
FQ:		2.19	F∆H:	1.55		
Fuel:		NAIF	SGTP (%):	7		
Notes	5:	None				
····				Clad	Temp (°F)	
LICEN	NSING E	BASIS				
	Analysi	s of Record PCT			2086	
PCT A	ASSESS	MENTS (Delta PCT)				
Α.	Prior E	CCS Model Assessme	nts			
	1. l	_OCBART Fluid Property	y Logic Issue		0	
В.	Planne	d Plant Modification Ev	valuations			
	1. I	None			0	
C.	2006 E	CCS Model Assessme	nts		_	
	1. I	BASH Minimum and Max	ximum Time Step Si	zes	0	
_	•					
D.	Other				0	
	1.	None			U	
LICE	NSING E	BASIS PCT + PCT ASSE	ESSMENTS	PC	= 2086	

......

	10 CFR \$	50.46 MARGIN UTILIZATI	ON - AREVA S	MALL B	REAK LOCA	۹	
Plant Utility	Name: / Name:	North Anna Power Station, Unit 2 Virginia Electric and Power Company					
Analy	sis Inform	ation					
EM:		AREVA SB EM	Limiting Brea	ak Size:	3 Inches		
Analysis Date:		2004					
Vend	or:	AREVA					
FQ:		2.32	F∆H:	1.65			
Fuel:	<u>.</u> .	Advanced Mark-BW	SGTP (%):	7			
10101			·····	<u>Clad</u>	Temp (°F)		
LICE	NSING BAS Analysis o	SIS of Record PCT			1370		
PCT / A.	ASSESSMI Prior ECO 1. No	ENTS (Delta PCT) CS Model Assessments ne			0		
В.	Planned 1. No	Plant Modification Evalu	ations		0		
C.	2006 ECC 1. No	CS Model Assessments ne			0		
D.	Other 1. No	ne			0		
LICE	NSING BA	SIS PCT + PCT ASSESSI	MENTS	PC	T = 1370		

10 CFR 50.46 MARGIN UTILIZATION – AREVA LARGE BREAK LOCA

Plant Utility	Name: Name	North Anna Power St Virginia Electric and I	North Anna Power Station, Unit 2 Virginia Electric and Power Company						
Analys	sis Info	ormation							
EM:		AREVA RLBLOCA E	M Limiting Break	Size:	DEG	θB			
Analysis Date: 2004									
Vendo	or:	AREVA							
FQ:		2.32	F∆H:	1.65					
Fuel:		Mixed:	SGTP (%):	12					
		Advanced Mark-BW							
Notes	:	None							
			,	Clad	Tem	p (°F)			
LICEN	Analys	BASIS is of Record PCT				1789			
PCT A	SSES	MENTS (Delta PCT)							
Α.	Prior I	ECCS Model Assessments							
	1.	Forslund-Rohsenow Correla	ation Modeling			64			
	2.	RWST Temperature Assum	ption			8			
	3.	LBLOCA/Seismic SG Tube	Collapse			0			
	4.	RLBLOCA Choked Flow Dis	sposition			22			
	5.	RLBLOCA Changes in Unce	ertainty Parameter	S		10			
В.	Plann	ed Plant Modification Eval	uations						
	1.	Advanced Mark-BW Top No	ozzle Modification			65			
C.	2006 I	ECCS Model Assessments							
	1.	None				0			
D.	Other								
	1.	None				0			
LICEN	ISING	BASIS PCT + PCT ASSESS	MENTS	PC	T =	1958			

Serial Number 07-0464 Docket Nos. 50-280/281

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

100	UFK 50.4	WARGIN UTILIZATIC	JN - WESTINGHOU	SE SIVIALL	BREAK LU	LA
Plant	Name:					
Utility	y Name:	Virginia Electric ar	nd Power Company			
Analy	sis Infor	mation				
EM:		NOTRUMP	Limiting Breal	k Size: 3 Ir	iches	
Analy	sis Date	: 1996				
Vend	or:	Westinghouse				
FQ:		2.5	F∆H:	1.7		
Fuel:		SIF	SGTP (%):	15		
Notes	5:	None				
		<u> </u>	······································	Clad Ten	np (°F)	
LICE	NSING B	ASIS				
	Analysis	s of Record PCT			1717	
PCT /	ASSESSI	MENTS (Delta PCT)				
Α.	Prior E	CCS Model Assessme	nts			
	1. N	IOTRUMP - Mixture Lev	el Tracking Errors		13	
	2. F	Removal of Part Length	CRDMs		-15	
	3. N	OTRUMP-Bubble Rise	/Drift Flux Model Inco	onsistencies	35	
в	Dianna	d Diant Madification E	voluotiono			
в.		Vestinghouse IEBA Euc	Valuations I Product Implement	otion	10	
	I. V	vestinghouse IFBA rue	a Product implementa	alion	10	
С	2006 E	CCS Model Assessme	nts			
0.	1 N	OTRUMP-FM Refined	Break Spectrum		85	
	•• •		Broak opeolium		00	
D.	Other					
	1. N	lone			0	
					-	
LICE	NSING B	ASIS PCT + PCT ASSE	ESSMENTS	PCT =	1845	

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE SMALL BREAK LOCA

10 C	CFR 5 <u>0</u>	46 MARGIN UTILIZATION	I – WESTINGHOU	SE LARGE	BREAK LOCA		
Plant Name:		Surry Power Station	Surry Power Station, Unit 1				
Utility	Name	Virginia Electric and	Virginia Electric and Power Company				
Analys	sis Info	ormation			········		
EM:		BASH	Limiting Breal	k Size: Cd=	-0.4		
Analysis Date:		e: 2001	-				
Vendo	or:	Westinghouse					
FQ:		2.32	F∆H:	1.62			
Fuel:		SIF	SGTP (%):	15			
Notes	:	None					
Clad Ter				Clad Tem	<u>ıp (°F)</u>		
LICEN	ISING	BASIS					
	Analys	is of Record PCT			2117		
PCT A	SSES	SMENTS (Delta PCT)					
А.	Prior I	CCS Model Assessment	S III		0		
	1.		OCA/Seismic SG Tube Collapse				
	Ζ.	BASH-EM Transient Term			0		
	3.	LOCBART Fluid Property I	Logic Issue		10		
	4.		ing Specific Heat N	Nodel Error	16		
	5.	PAD 4.0 Initial Pellet Temp			-11		
	b. 7	Removal of Part-Length C	oval of Part-Length CRDMs				
	1.	Pressurizer Surge Line Pip	oing Schedule Reco	onciliation	8		
	8.	LOCBART Fluid Property I	-ogic Issue-Augme	ented	10		
	9.	Revised Containment Hea	t Sink Input		113		
	10.	Revised Containment Spra	ay Flowrate		-17		
	11. Revised Containment Free Volume				-1/		
	12.	LOCBART Fluid Property I	_ogic Issue-Augme	ented	-10		
B	Plann	ed Plant Modification Eva	luations				
υ.	1	Westinghouse IEBA Fuel I	Product Implement	ation	41		
	••		roudot implement				
C. 2006 ECCS Model Assessments							
	1.	BASH Minimum and Maxir	num Time Step Siz	zes	0		
D.	Other						
	1.	None			0		
	ISING	BASIS PCT + PCT ASSES	SMENTS	PCT =	2194		

10 CFR 50.46 MARGIN UTILIZATION – WESTINGHOUSE SMALL BREAK LOCA							
Plant Name:		Surry Power Statio	Surry Power Station, Unit 2				
Utility Name:		Virginia Electric ar	Virginia Electric and Power Company				
Analys	sis Inform	ation					
EM:		NOTRUMP	Limiting Break Size: 3 Inches		ches		
Analysis Date:		1996					
Vendo	or:	Westinghouse					
FQ:		2.5	F∆H:	1.7			
Fuel:		SIF	SGTP (%):	15			
Notes	•	None					
Clad Temp (°F)							
LICEN	ISING BAS	SIS					
	Analysis c	of Record PC1			1/1/		
PCT ASSESSMENTS (Delta PCT) A Prior FCCS Model Assessments							
	1. NC	RUMP - Mixture Level Tracking Errors			13		
2. Rem		moval of Part Length	oval of Part Length CRDMs				
	3. NC	TRUMP-Bubble Rise	/Drift Flux Model Inc	onsistencies	35		
в	Planned	Plant Modification E	valuations				
-	1. We	estinghouse IFBA Fue	I Product Implement	ation	10		
C.	2006 ECC 1. NC	F Model Assessments RUMP-EM Refined Break Spectrum			85		
D.	Other						
	1. No	ne			0		
LICEN	ISING BA	SIS PCT + PCT ASSE	SSMENTS	PCT =	1845		

100	7K 30	.40 IVIA	KOIN UTILIZATION -	WESTINGHUUS		E DREAR LUCA	<u> </u>
Plant	Name:		Surry Power Station, U	nit 2			
Utility	Name:		Virginia Electric and Pc	wer Company			
Analys	sis Info	ormatio	on				
EM:			BASH	Limiting Break	Size: (Cd=0.4	
Analysis Date:		e:	2001	j			
Vendo	or:		Westinghouse				
FQ:			2.32	F∧H:	1 62		
Fuel			SIF	SGTP (%)	15		
Notes			None				
	•					omn (°E)	
					<u>Ciau i</u>	emp (r)	
LICEN		DAJIJ	agard DCT			0117	
	Analys					2117	
PCT A	SSES	SMENT	S (Delta PCT)				
Α.	Prior I	ECCS	Model Assessments				
	1.	LBLO	CA/Seismic SG Tube C	ollapse		0	
	2.	BASH	-EM Transient Terminat	tion		0	
	3.	LOCB	ART Fluid Property Log	ic Issue		10	
	4.	LOCB	ART ZIRLO™ Cladding	Specific Heat Me	odel Erro	or 16	
	5.	 5. PAD 4.0 Initial Pellet Temperatures 6. Removal of Part-Length CRDMs 			-11		
	6.				-66		
	7.	Pressu	surizer Surge Line Piping Schedule Reconciliation BART Fluid Property Logic Issue-Augmented			8	
	8.	LOCB				10	
	 Revised Containment Heat Sink Input Revised Containment Spray Flowrate Revised Containment Free Volume 				113		
					-17		
					-17		
	12.	LOCB	ART Fluid Property Log	ic Issue-Augmen	ted	-10	
В.	Plann	ed Pla	nt Modification Evalua	ations			
	1.	Westir	nghouse IFBA Fuel Pro	duct Implementat	tion	41	
C.	2006 I	ECCSI	Model Assessments				
	1.	BASH	Minimum and Maximur	n Time Step Size	es	0	
D.	Other						
	1.	None				0	
LICE	ISING	BASIS	PCT + PCT ASSESSN	IENTS	PCT	= 2194	