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Attn: Document Control Desk U. S. Nuclear Regulatory Commission Washington, DC 20555-0001 Serial No.: 22-165 NRA/YG: R0 Docket No.:50-336/423 50-338/339 50-280-281 50-395 License No.: DPR-65/NPF-49 NPF-4/7 DPR-32/37 NPF-12

DOMINION ENERGY NUCLEAR CONNECTICUT, INC VIRGINIA ELECTRIC AND POWER COMPANY DOMINION ENERGY SOUTH CAROLINA, INC MILLSTONE POWER STATION UNITS 2 AND 3 NORTH ANNA POWER STATION UNITS 1 AND 2 SURRY POWER STATION UNITS 1 AND 2 VIRGIL C. SUMMER NUCLEAR STATION UNIT 1 2021 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENT OF 10 CFR 50.46

June 22, 2022

Pursuant to the provisions of 10 CFR 50.46(a)(3)(ii), Dominion Energy Nuclear Connecticut, Inc. (DENC), Virginia Electric and Power Company (Dominion Energy Virginia), and Dominion Energy South Carolina, Inc. (DESC) hereby submit the annual summary of permanent changes to the emergency core cooling system (ECCS) evaluation models (EMs) for Millstone Power Station (MPS) Units 2 and 3, North Anna Power Station (NAPS) Units 1 and 2, Surry Power Station (SPS) Units 1 and 2, and Virgil C. Summer Nuclear Station (VCSNS) Unit 1, respectively.

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

Information regarding the effect of the ECCS EM changes upon the reported SBLOCA and LBLOCA analysis of record results is provided for MPS 2 and 3, NAPS 1 and 2, SPS 1 and 2, and VCSNS 1 in Attachment 2, 3, 4 and 5, respectively. The calculated peak cladding temperature (PCT) for the SBLOCA and LBLOCA analysis for MPS 2 and 3, NAPS 1 and 2, SPS 1 and 2, and VCSNS 1 are summarized below:

Millstone Unit 2	Small break – Framatome EM:	1714°F
Millstone Unit 2	Large break – Framatome EM (Zr4 fuel):	1845°F
Millstone Unit 2	Large break – Framatome EM (M5 fuel):	1615°F
Millstone Unit 3	Small break – Westinghouse EM:	1193°F

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Millstone Unit 3	Large break – Westinghouse EM:	1933°F
North Anna Units 1 and 2	Small break – Westinghouse EM:	1834.1°F
North Anna Units 1 and 2	FVI Small break – Framatome EM:	1801°F
North Anna Units 1 and 2	Large break – Westinghouse EM:	1982°F
Surry Units 1 and 2	Small break – Westinghouse EM:	2012°F
Surry Units 1 and 2	FVI Small break – Framatome EM:	1673°F
Surry Units 1 and 2	Large break – Westinghouse EM:	2071°F
Virgil C. Summer Unit 1	Small break – Westinghouse EM:	1923°F
Virgil C. Summer Unit 1	Westinghouse Full Spectrum LOCA EM	
	Region I Small break:	1108°F
Virgil C. Summer Unit 1	Large break – Westinghouse EM:	
	Blowdown:	1814°F
	Reflood 1:	1814°F
	Reflood 2:	1961°F
	Composite:	1961°F
Virgil C. Summer Unit 1	Westinghouse FSLOCA EM	
	Region II large break:	1879°F

The LOCA results for MPS 2 and 3, NAPS 1 and 2, SPS 1 and 2, and VCSNS 1 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.

The information contained herein satisfies the 2021 annual reporting requirements of 10 CFR 50.46(a)(3)(ii).

Should you have any questions regarding this submittal, please contact Yan Gao at (804) 273-2768.

Respectfully, Nan M. Adam

Wayne M. Adams Director – Nuclear Engineering and Fuel Dominion Energy Nuclear Connecticut, Inc. Virginia Electric and Power Company Dominion Energy South Carolina, Inc.

Commitments made in this letter: None.

Attachments:

- 1. Report of Changes in Framatome and Westinghouse ECCS Evaluation Models
- 2021 Annual Reporting of 10 CFR 50.46 Margin Utilization Millstone Power Station Units 2 and 3
- 3. 2021 Annual Reporting of 10 CFR 50.46 Margin Utilization North Anna Power Station Units 1 and 2
- 2021 Annual Reporting of 10 CFR 50.46 Margin Utilization Surry Power Station Units 1 and 2
- 5. 2021 Annual Reporting of 10 CFR 50.46 Margin Utilization Virgil C. Summer Nuclear Station Unit 1
- cc: U.S. Nuclear Regulatory Commission, Region I Regional Administrator 475 Allendale Road, Suite 102 King of Prussia, PA 19406-1415

U.S. Nuclear Regulatory Commission, Region II Regional Administrator Marquis One Tower 245 Peachtree Center Avenue, NE Suite 1200 Atlanta, Georgia 30303-1257

Mr. G. Edward Miller NRC Senior Project Manager – North Anna Power Station and Virgil C. Summer Nuclear Station U. S. Nuclear Regulatory Commission One White Flint North Mail Stop 09 E-3 11555 Rockville Pike Rockville, Maryland 20852-2738

Mr. R. Guzman NRC Project Manager – Millstone Power Station U. S. Nuclear Regulatory Commission One White Flint North Mail Stop 08 C2 11555 Rockville Pike Rockville, MD 20852-2738

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Mr. L. John Klos NRC Project Manager – Surry Power Station U. S. Nuclear Regulatory Commission One White Flint North Mail Stop 09 E-3 11555 Rockville Pike Rockville, MD 20852-2738

NRC Senior Resident Inspector V.C. Summer Nuclear Station

NRC Senior Resident Inspector Millstone Power Station

NRC Senior Resident Inspector North Anna Power Station

NRC Senior Resident Inspector Surry Power Station

Old Dominion Electric Cooperative Electronically Distributed

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Attachment 1

REPORT OF CHANGES IN FRAMATOME AND WESTINGHOUSE ECCS EVALUATION MODELS

Millstone Power Station Units 2 and 3 North Anna Power Station Units 1 and 2 Surry Power Station Units 1 and 2 Virgil C. Summer Nuclear Station Unit 1 Dominion Energy Nuclear Connecticut, Inc. Virginia Electric and Power Company Dominion Energy South Carolina, Inc.

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REPORT OF CHANGES IN FRAMATOME AND WESTINGHOUSE ECCS EVALUATION MODELS

MILLSTONE POWER STATION UNIT 2

- 1. Framatome identified no changes or errors applicable to the EMF-2328(P)(A) Revision 0, with Supplement 1 evaluation model for Small Break LOCA (SBLOCA) for Millstone Unit 2 during 2021.
- 2. Framatome identified no changes or errors applicable to the SEM/PWR-98 evaluation model for Large Break LOCA (LBLOCA) for Millstone Unit 2 during 2021. This evaluation model is applicable to the Millstone Unit 2 fuel with Zr-4 cladding.
- 3. On January 24, 2017, a new LBLOCA analysis was approved by the NRC based upon the EMF-2103(P)(A), Revision 3, "Realistic Large Break LOCA (RLBLOCA) Methodology for Pressurized Water Reactors." The new analysis is applicable to the AREVA Standard CE14 HTP fuel product with the M5[™] fuel rod cladding only. The analysis predicted a PCT of 1615°F.

Framatome identified no changes or errors applicable to the EMF-2103(P)(A), Revision 3, evaluation model for RLBLOCA for Millstone Unit 2 during 2021.

MILLSTONE POWER STATION UNIT 3

- 1. Westinghouse identified the following changes applicable to the 1985 Westinghouse SBLOCA Evaluation Model with NOTRUMP for Millstone Unit 3 during 2021:
- Reduction in Flow Area to the Bottom of the Barrel/Baffle Region

For plants without holes in the edge of the lower core plate, the flow area from the bottom of the core to the barrel/baffle region has historically been modeled as the gap between the baffle plate and the lower core plate, and this flow area did not consider the reduced flow area due to the presence of the bottom nozzle flow skirt. The impact of reducing the flow area between the core and barrel baffle region due to including the bottom nozzle flow skirt has been qualitatively evaluated. The evaluation determined that considering a reduced flow area from the bottom of the core to the barrel/baffle region when considering the bottom nozzle flow skirt has a negligible effect on the SBLOCA analysis results, leading to an estimated peak cladding temperature (PCT) impact of 0°F.

Measurement Uncertainty Recapture (MUR) Uprate

The Analysis of Record was examined for the impact of a planned MUR which will be implemented in Cycle 22. It was determined that the MUR would have a 0° impact on the SBLOCA PCT.

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 Westinghouse identified the following change applicable to the 2004 Westinghouse Best Estimate (BE) LBLOCA Evaluation Model (EM) using the Automated Statistical Treatment of Uncertainty Method (ASTRUM) for Millstone Unit 3 during 2021:

Measurement Uncertainty Recapture (MUR) Uprate

The Analysis of Record was examined for the impact of a planned MUR which will be implemented in Cycle 22. As discussed in the MUR LAR, a reduction in peaking factors fully offsets the impact of the MUR power increase on the MPS3 ASTRUM BE LBLOCA AOR. Therefore, the MUR would have a 0°F impact on the BE LBLOCA PCT.

NORTH ANNA POWER STATION UNITS 1 AND 2

- 1. Westinghouse identified the following change applicable to the 1985 Westinghouse SBLOCA Evaluation Model with NOTRUMP for North Anna Units 1 and 2 during 2021:
- Reduction in Flow Area to the Bottom of the Barrel/Baffle Region

For plants without holes in the edge of the lower core plate, the flow area from the bottom of the core to the barrel/baffle region has historically been modeled as the gap between the baffle plate and the lower core plate, and this flow area did not consider the reduced flow area due to the presence of the bottom nozzle flow skirt. The impact of reducing the flow area between the core and barrel baffle region due to including the bottom nozzle flow skirt has been qualitatively evaluated. The evaluation determined that considering a reduced flow area from the bottom of the core to the barrel/baffle region when considering the bottom nozzle flow skirt has a negligible effect on the SBLOCA analysis results, leading to an estimated peak cladding temperature (PCT) impact of 0°F.

2. On March 19, 2021, a new Fuel Vendor Independent (FVI) SBLOCA analysis was approved by the NRC based upon the Framatome Topical Report EMF-2328(P)(A), Revision 0, PWR [pressurized water reactor] Small Break LOCA [lossof-coolant accident] Evaluation Model, S-RELAP5 Based. The analysis predicted a PCT of 1801°F. This analysis became the Analysis of Record during 2021.

Framatome identified no changes or errors applicable to the EMF-2328(P)(A), Revision 0, PWR Small Break LOCA EM using S-RELAP5 for North Anna Units 1 and 2 during 2021.

3. Westinghouse identified no changes or errors applicable to the 2004 Westinghouse BE LBLOCA EM using ASTRUM for North Anna Units 1 and 2 during 2021.

SURRY POWER STATION UNITS 1 AND 2

1. Westinghouse identified the following change applicable to the 1985 Westinghouse SBLOCA Evaluation Model with NOTRUMP for Surry Units 1 and 2 during 2021:

Reduction in Flow Area to the Bottom of the Barrel/Baffle Region

For plants without holes in the edge of the lower core plate, the flow area from the bottom of the core to the barrel/baffle region has historically been modeled as the gap between the baffle plate and the lower core plate, and this flow area did not consider the reduced flow area due to the presence of the bottom nozzle flow skirt. The impact of reducing the flow area between the core and barrel baffle region due to including the bottom nozzle flow skirt has been qualitatively evaluated. The evaluation determined that considering a reduced flow area from the bottom of the core to the barrel/baffle region when considering the bottom nozzle flow skirt has a negligible effect on the SBLOCA analysis results, leading to an estimated peak cladding temperature (PCT) impact of 0°F.

2. On March 19, 2021, a new Fuel Vendor Independent (FVI) SBLOCA analysis was approved by the NRC based upon the Framatome Topical Report EMF-2328(P)(A), Revision 0, PWR [pressurized water reactor] Small Break LOCA [lossof-coolant accident] Evaluation Model, S-RELAP5 Based. The analysis predicted a PCT of 1673°F. This analysis became the Analysis of Record during 2021.

Framatome identified the following error applicable to the EMF-2328(P)(A), Revision 0, PWR Small Break LOCA EM using S-RELAP5 for Surry Units 1 and 2 during 2021:

<u>SBLOCA Rod History Truncation (FVI-SBLOCA downflow baffle)</u>

Framatome topical EMF-2328(P)(A), for W&CE SBLOCA methods, specifies that the end of first cycle rod conditions are to be used. This is done by running RODEX2-2A with the identified power history and then truncating it to a point which exceeds the targeted end of-cycle (EOC) rod average burnup. The SBLOCA analysis guidelines were not explicitly followed in preparing the RODEX2-2A initialization for the Surry FVI-SBLOCA analysis of record (downflow baffle). The result was that the RODEX2-2A initialization was truncated prior to reaching the desired target rod average burnup.

Properties such as pin pressure and gap conductance would differ depending on the truncation. However, the difference is <3000 MWd/MTU and the SBLOCA event itself has a strong impact on the evolution of the properties and significance of the difference. The differences in fuel rod properties between the RODEX initialization time-in-cycle point used in the analysis and that prescribed by the guidance is negligible in consideration of the SBLOCA event. The Δ PCT for the Surry Units 1 and 2 FVI-SBLOCA analysis (downflow baffle) is 0°F.

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3. Westinghouse identified no changes or errors applicable to the 2004 Westinghouse BE LBLOCA EM using ASTRUM for Surry Units 1 and 2 during 2021.

VIRGIL C. SUMMER NUCLEAR STATION UNIT 1

- 1. Westinghouse identified the following change applicable to the 1985 Westinghouse SBLOCA Evaluation Model with NOTRUMP for Virgil C. Summer during 2021:
- Reduction in Flow Area to the Bottom of the Barrel/Baffle Region

For plants without holes in the edge of the lower core plate, the flow area from the bottom of the core to the barrel/baffle region has historically been modeled as the gap between the baffle plate and the lower core plate, and this flow area did not consider the reduced flow area due to the presence of the bottom nozzle flow skirt. The impact of reducing the flow area between the core and barrel baffle region due to including the bottom nozzle flow skirt has been qualitatively evaluated. The evaluation determined that considering a reduced flow area from the bottom of the core to the barrel/baffle region when considering the bottom nozzle flow skirt has a negligible effect on the SBLOCA analysis results, leading to an estimated peak cladding temperature (PCT) impact of 0°F.

2. On June 20, 2021, a new analysis was approved by the NRC based upon the Westinghouse Topical Report WCAP-16996-P-A, Revision 1, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FSLOCA)." The new SBLOCA AOR analysis is defined as the Region I spectrum. The analysis predicted a PCT of 1108°F which includes a 12°F correction to account for gamma energy redistribution. This analysis became the Analysis of Record during 2021.

Westinghouse identified no changes or errors applicable to the WCAP-16996-P-A Region I EM for VCSNS during 2021.

- 3. Westinghouse identified no changes or errors applicable to the 1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model for Virgil C. Summer during 2021.
- 4. On June 20, 2021, a new analysis was approved by the NRC based upon the Westinghouse Topical Report WCAP-16996-P-A, Revision 1, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FSLOCA)." The new LBLOCA AOR analysis is defined as the Region II spectrum. The analysis predicted a PCT of 1879°F which includes a 31°F correction to account for gamma energy redistribution. This analysis became the Analysis of Record during 2021.

Westinghouse identified no changes or errors applicable to the WCAP-16996-P-A Region II EM for VCSNS during 2021.

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CONCLUSION

The LOCA results for Millstone Units 2 and 3, North Anna Units 1 and 2, Surry Units 1 and 2 and Virgil C. Summer Unit 1 are confirmed in the PCT rackup tables, Attachments 2 through 5, to have 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 annual reporting requirements of 10 CFR 50.46(a)(3)(ii) for calendar year 2021.

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Attachment 2

2021 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION – MILLSTONE POWER STATION UNITS 2 AND 3

Dominion Energy 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 Energy Nuclear Con	nnecticut, Inc.					
Analysis Inform	ation						
	pp. 1, SBLOCA, S-RELAP5 Based	Limiting Break Size:	3.78 Inches				
Analysis Date:	April 2015						
Vendor:	AREVA						
Peak Linear Pov							
Notes:	None						
			Clad Temp(°F)				
LICENSING BA							
Analysis	of Record PCT		1707				
DOT LOOPOOL							
	ENTS (Delta PCT) CCS Model Assessments						
	Circ-4 Product Penalty		4				
	45 LOCA Swelling and Rupture		0				
	-RELAP5 Oxidation Calculations		3				
5. 0	REAL IS CAUGION ON CONTINUES		5				
B. Planned	Plant Modification Evaluations						
1. N	None		0				
C. 2021 EC	CS Model Assessments						
1. N	Jone		0				
D. Other							
1. N	Vone		0				
TICENCINC DA	OIS DOT . DOT ASSESS TRANS	Therease	1714				
LICENSING BA	JCENSING BASIS PCT + PCT ASSESSMENTS PCT = 1714						

Diane	N	10 CFR 50.40 MARGEN OT ILLATION - LARGE BREAT	
	Name:	Millstone Power Station, Unit 2	
-	Name:	Dominion Energy Nuclear Connecticut, Inc.	
	sis Infor		
EM:		SEM/PWR-98 Limiting Break Size:	1.0 DECLG
	sis Date:		
Vendo		AREVA	
	Linear P		
Notes:	:	None	
TIOT		D 1 010	Clad Temp(°F)
LICE	NSING 1		1014
	Anarys	is of Record PCT	1814
DOT	CCECCI	MENTE (D-k- BCT)	
A.		MENTS (Delta PCT) ECCS Model Assessments	
л.	1.	Corrected Corrosion Enhancement Factor	-1
	2.		-1 0
	2. 3.	ICECON Coding Errors	
		Setting RFPAC Fuel Temperatures at Start of Reflood	-2
	4.	SISPUNCH/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
	22.	ICECON Code Errors	0
	23.	Containment Sump Modification and Replacement PZR	2
	24.	Non-Conservative RODEX Fuel Pellet Temperature	20
	25.	Array Index Issues in the RELAP4 Code	0
ъ	DI	J Direct M. B. Miller Mar. Trada Mar.	
В.		d Plant Modification Evaluations	0
	1.	None	0
C.	2021 5	CCS Model Assessments	
U .	1. Non		0
	1. INOR	C	U
D.	Other		
<i>D</i> .	1.	None	0
	1.	11016	v
TIOP	NETNO		1842
LICE	INSTING 1	BASIS PCT + PCT ASSESSMENTS PCT =	1845

10 CFR 50.46 MARGIN UTILIZATION - LARGE BREAK LOCA

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	Name:		n, Unit 2 (M5 Fuel)	LOCA	
	Name:		Dominion Energy Nuc		
	sis Infor				
EM:			EMF-2103	Limiting Break Size:	1.0 DEGB
	sis Date	:	January 2017		
Vend			AREVA		
Peak	Linear	Power:	15.1 kW/ft		
Notes			None		
					Clad Temp(°F)
LICE	NSING	BASIS			
	Analy	sis of Re	ecord PCT		1615
			S (Delta PCT) Model Assessments		
A.					
	1.		nent of Hot Leg Piping F		0
	2.		OCA Swelling and Ruptu		0
	3.		AP5 Oxidation Calculat		0
	4. 5.		art-Pawel correlation imp		0
	5.		ressure not reset after rup calculations	mile in S-KELAFJ	0
	6.		tion enclosure input error		0
	0.	Radia	non enclosure input error		v
B.	Plann	ed Plan	t Modification Evaluati	ons	
-	1.	None			0
C.	2021	ECCS M	fodel Assessments		
	1.	None			0
	Other				
D.	~				0

Plant Name Utility Nam		Millstone Power Stat Dominion Energy Nu	tion, Unit 3 uclear Connecticut, Inc.		
Analysis In					
EM:		NOTRUMP	Limiting Break	Size:	4 inches
Analysis Da	ite:	02/07/07			
Vendor:		Westinghouse			
FQ:		2.6	FdH:	1.65	
Fuel:		RFA-2	SGTP (%):	10	
Notes:		None			
					Clad Temp (°F)
LICENSIN	G BASIS				
	lysis of Re	cord PCT			1193
PCT ASSE	SSMENTS	S (Delta PCT)			
		Iodel Assessments			
1.			ver Plenum Surface Area		
	Calcul				0
2.			Used From Drawings		õ
3.			mal Conductivity Calcul	ation	ō
4.		Crack and Dish Volum			Ō
5.			Temperature Uncertaint	v	ō
6.		um Fuel Rod Time St	ō		
7.		ion Heat Transfer Logi	õ		
8.		UMP-EM Evaluation	õ		
0.		ctivity Degradation			·
9.		CTA Cladding Strain H	Requirement for Fuel		0
	Rod B	-			v
10.		od Gap Conductance H	Smor		0
11.		ion Heat Transfer Mod			õ
12.		CTA Pre-DNB Claddin			õ
		cient Calculation			•
13.	-	on of AXIOMTM Clade	ling I TAs		0
14.		Average Temperature			õ
15.			uid Volume Calculation		õ
16.		uel Pellet Heat Capacit			ő
17.		Break LOCA PAD5 In			ō
B. Plau	ned Plant	Modification Evalua	tions		
1.		rement Uncertainty Re			0
		, 	1		
		lodel Assessments			
1.	Reduct Region		e Bottom of the Barrel/B	affle	0
D. Oth	er				
1.	None				0
		PCT + PCT ASSESS		PCT =	
					= 1193

10 CFR 50.46 MARGIN UTILIZATION - SMALL BREAK LOCA

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		10 CF	R 50.46 MARGIN UT	ILIZATION - LARGE BR	EAK LOCA
Plant	Name:		Millstone Power Statio	m, Unit 3	
	y Name		Dominion Energy Nuc	lear Connecticut, Inc.	
Anah	vsis Info	ormation			
EM.			ASTRUM (2004)	Limiting Break Size:	Guillotine
Analy	sis Dat	te:	04/17/07		
Vend	or:		Westinghouse		
FQ:			2.6	EdH: 1.0	
Fuel:			RFA-2	SGTP (%): 10	
Notes	;:		None		
					Clad Temp (°F)
LICE		BASIS			1781
	Anany	ysis of Rec	olarui		1781
PCT	ASSES	SMENTS	(Delta PCT)		
A.			odel Assessments		
	1.		OT Burst Temperature	Logic Errors	0
	2.		Hobal Volume Error	8	0
	3.		OT Gap Heat Transfer	Logic	0
	4.		ancy in Metal Masses I		0
	5.	Error in	ASTRUM Processing	of Average Rod Burnup	
			Internal Pressure		0
	6.			emperature Uncertainty	0
	7.		nd PMID Evaluation		0
	8.	Evaluati	ion of Fuel Pellet Them	nal Conductivity	222
		Degrada			
	9.		OT Burst Temperature	Calculation	0
			LO Cladding		-
	10.		emal Pressure Calculati		0
	11.		OT Iteration Algorithm		0
	13		Fuel Pellet Average Ter		•
	12		RA/TRAC Thermal-Hy		0
	13.		ion used in HSDRIVER	Restart Process Logic Error	0
	14.		uel Pellet Average Ten		0
	17.	Calculat		iperature oncertainty	8
	15.		ons for Heat Slab Temp	erature Initialization	0
	16.		ansfer Model Error Cor		ŏ
	17.		ion to Heat Transfer No		Ō
	18.		onservation Error Fix		ō
	19.	Correcti	ion to Split Channel Mo	mentum Equation	0
	20.			1 for Rod Burst Calculation	0
	21.		s to Vessel Superheated		0
	22.		to Metal Density Refer		0
	23.	Decay F	Heat Model Error Corre	ctions	0
	24.		ion to the Pipe Exit Pre		0
	25.			mension Error Correction	0
	26.		Heat Transfer Multipli		-91
	27.		OT Burst Strain Error		21
	28.		s to Grid Blockage Rati		0
	29.		at Transfer Enhanceme	nt Calculation	0
	30.		levation Selection	inter Rentered	0
	31.		n Decay Group Uncerta		0
	32.	Errors n	a aupport Plate, Core E	arrel, and Vessel Wall	0

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		Unheated Conductor			
	33.	Error in Oxidation Calculations		0	
	34.	Error in use of ASME Steam Tables		0	
	35.	Insertion of AXIOM [™] Cladding LTAs		0	
	36.	Vessel Average Temperature Uncertainty		0	
	37.	Inconsistent Application of Numerical Ramp Applied		0	
		to the Entrained Liquid / Vapor Interfacial Drag Coeffic	ient		
	38.	Inappropriate Resetting of Transverse Liquid Mass Flow		0	
	39.	Steady-State Fuel Temperature Calibration Method		0	
	40.	Millstone Unit 3 Cycle 20 PBOT/PMID Violations		0	
	41.	Vapor Temperature Resetting		0	
	42.	Core Barrel Heat Slab Error		0	
	43.	Cold Leg Volume Error		0	
	44.	Core Barrel Wetted Perimeter Error		0	
	45.	Removal of the Vessel Interfacial Heat Transfer Limit		0	
	46.	Cycle 21 PBOT/PMID Envelope Violations		0	
B.	Plann	ed Plant Modification Evaluations			
	1.	Measurement Uncertainty Recapture Uprate		0	
С.		CCS Model Assessments		-	
	1.	None		0	
D.	Other				
	1.	None		0	
			-		
LICE	NSING.	BASIS PCT + PCT ASSESSMENTS	PCT =	1933	

Serial No. 22-165 Docket No. 50-338/339

Attachment 3

2021 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION – NORTH ANNA POWER STATION UNITS 1 AND 2

Virginia Electric and Power Company North Anna Power Station Units 1 and 2

	Name:		a Power Sta			
Utilit	y Name:	Virginia E	lectric and P	ower Company		
Analy	vsis Info	mation				
EM:		NOTRUM		Limiting Brea	ak Size:	2.75 inches
	ysis Date					
Vend	or:	Westingho	use			
FQ:		2.32		FΔH:	1.65	
Fuel		RFA-2		SGTP (%):	7	
Notes	:	None				
						Clad Temp (°F)
LICE	NSING					
	Analy	is of Record PCT				1834.1
-			-			
		MENTS (Delta PC				
A.		ECCS Model Asses		T 1 D 11 / TL 1		0
	1.			Fuel Pellet Thermal		0
	2	Conductivity Deg				0
	2.	SBLOCA Claddin Rod Burst	g Strain Keq	unement for rue		0
	3.	Fuel Rod Gap Cor	ductance Fe	CONF.		0
	J. 4.	Radiation Heat Tra		õ		
	т. 5.	SBLOCTA Pre-D				õ
	2.	Coefficient Calcul		racut remotes		•
	6.			d Volume Calculatio	on.	0
	7.	UO2 Fuel Pellet H				Ō
B.		d Plant Modificati	on Evaluati	0115		
	1.	None				0
~	2027	CC8 11.3.1 4				
C.	1.	CCS Model Assess		Bottom of the Barrel	/D_69-	0
	1.	Region	Alea to me	bottom of the Darres	Dame	U
		RESION				
D.	Other					
	1.	None				0
					-	
TOT	NSINC	BASIS PCT + PCT	ASSESSM	ENTS	PCT =	= 1834.1

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE SMALL BREAK LOCA

10 CFR 50.46 MARGIN UTILIZATION - FRAMATOME FVI SMALL BREAK LOCA						
Plant	Name:	North Anna Power Station, Un	uit 1			
Utility	v Name:	Virginia Electric and Power Co	ompany			
Analy	sis Informa	tion	a.			
EM:	W&CE SE	SLOCA EMF-2328	Limiting Bre	ak Size:	6.5 inches	
Analy	sis Date:	May 2018				
Vende	or:	Framatome				
FQ:		2.5	FAH:	1.65		
Fuel:		Representative 17x17 Non-M5	SGTP (%):	7		
Notes	:	None				
					Clad Temp (°F)	
LICE	NSING BAS	SIS				
	Analysis o	f Record PCT			1801	
		NTS (Delta PCT)				
A.		CS Model Assessments			-	
	1. No	one			0	
73	101	lant Modification Evaluations				
В.		nant Alocincation Evaluations			0	
	1. 190	me			0	
C.	2021 FCC	S Model Assessments				
.		me			0	
		/1M			v	
D.	Other					
		one			0	
					-	
LICE	NSING BAS	SIS PCT + PCT ASSESSMENTS		PCT =	1801	
-						

		MARGIN UTILIZATION - WESTINGHOUSE LARGE B	
	Name:	North Anna Power Station, Unit 1	
Jtility	Name:	Virginia Electric and Power Company	
Analy	sis Info	rmation	
M		ASTRUM (2004) Limiting Break Size:	DEGB
naly	sis Date	: 8/25/2010	
Vendo)Г:	Westinghouse	
FQ:		2.32 FAH: 1.65	
uel:		RFA-2 SGTP (%): 7	
Votes:	Core Po	wer $\leq 100\%$ of 2951 MWt; SG Model 54F; 17x17 RFA-2 Fuel with ZIRLOS	or Optimized ZIRLOT
ladding	, Non-IF	BA or IFBA, IFMs	
TOTA		D 4 010	Clad Temp (°F)
ICL	NSING		1070
	Analy	sis of Record PCT	1852
OCT 4	CCECC	MENTS (Dalta BCT)	
A.		MENTS (Delta PCT) ECCS Model Assessments	
	1.	Evaluation of Fuel Pellet Thermal Conductivity	135
	1.	Degradation	155
	2.	HOTSPOT Burst Temperature Calculation	0
		for ZIRLO Cladding	v
	3.	Rod Internal Pressure Calculation	0
	4.	HOTSPOT Iteration Algorithm for Calculating the	ō
		Initial Fuel Pellet Average Temperature	
	5.	WCOBRA/TRAC Thermal-Hydraulic History File	0
		Dimension used in HSDRIVER Background	-
	6.	WCOBRA/TRAC Automated Restart Process Logic Error	0
	7.	Initial Fuel Pellet Average Temperature Uncertainty	1
		Calculation	
	8.	Elevations for Heat Slab Temperature Initialization	0
	9.	Heat Transfer Model Error Corrections	0
	10.	Correction to Heat Transfer Node Initialization	0
	11.	Mass Conservation Error Fix	0
	12.	Correction to Split Channel Momentum Equation	0
	13.	Heat Transfer Logic Correction for Rod Burst Calculation	0
	14.	Changes to Vessel Superheated Steam Properties	0
	15.	Update to Metal Density Reference Temperatures	0
	16.	Decay Heat Model Error Corrections	0
	17.	Correction to the Pipe Exit Pressure Drop Error	0
	18.	WCOBRA/TRAC U19 File Dimension Error Correction	0
	19.	Revised Heat Transfer Multiplier Distributions	-27
	20.	HOTSPOT Burst Strain Error Correction	21
	21.	Changes to Grid Blockage Ratio and Porosity	0
	22.	Grid Heat Transfer Enhancement Calculation	0
	23.	Vessel Section 7 Mid-Level Elevation Modeling	0
	24.	Burst Elevation Selection	0
	25.	Errors in Decay Group Uncertainty Factors	0
	26.	Error in Oxidation Calculations	0
	27.	Error in use of ASME Steam Tables	0
	28.	Support Column Core Barrel Unheated Conductor Errors	0

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	29.	Inconsistent Application of Numerical Ramp Applied		0				
		to the Entrained Liquid / Vapor Interfacial Drag Coefficient						
	30.	Inappropriate Resetting of Transverse Liquid Mass Flow		0				
	31.	Steady-State Fuel Temperature Calibration Method		0				
	32.	Correction to Fuel Pellet TCD Assessment		0				
	33.	Vapor Temperature Resetting		0				
	34.	Removal of the Vessel Interfacial Heat Transfer Limit		0				
B.	Plann	Planned Plant Modification Evaluations						
	1.	None		0				
C.	2021 1	ECCS Model Assessments						
	1.	None		0				
D.	Other							
	1.	None						
LICE	INSING	BASIS PCT + PCT ASSESSMENTS PC	Γ=	1982	· · · · ·			

	Name:	North Anna Power			
Utilit	v Name:	Virginia Electric an	d Power Company		
	sis Informa	tion			
EM:		NOTRUMP	Limiting Break	Size:	2.75 inches
	sis Date:	12/20/2010			
Vend	or:	Westinghouse			
FQ:		2.32	FAH:	1.65	
Fuel:		RFA-2	SGTP (%):	7	
Notes	:	None			
					Clad Temp (°F)
LICE	NSING BAS				
	Analysis o	f Record PCT			1834.1
The state	100T003 -T				
		NTS (Delta PCT)			
A.		CS Model Assessments OTRUMP-EM Evaluation	- CE- 1 D-11-1 Th1		0
			of Fuel Pellet Inermal		0
		inductivity Degradation	Dennise and Gen Tend		0
		LOCTA Cladding Strain	Requirement for Fuel		0
		el Rod Gap Conductance	Freeze		0
		diation Heat Transfer Mo			0 0
		BLOCTA Pre-DNB Cladd			õ
		efficient Calculation	ang i teat i tansiei		v
			Fluid Volume Calculation		0
		D ₂ Fuel Pellet Heat Capac			õ
B.	Planned P	lant Modification Evalu	ations		
		me	auona		0
C.	2021 ECC				
U .		S Model Assessments duction in Flow Area to t	0		
		gion	ne Bottom of the Barrer B	ame	0
D.	Other				
	1. No	me			0

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: W&CE SBLOCA EMF-2328 Limiting Break Size: 6.5 inches Analysis Date: May 2018 Vendor: 6.5 inches Analysis Date: May 2018 Vendor: Framatome FQ: 2.5 FAH: 1.65 Fuel: Representative 17x17 Non-MS SGTP (%): 7 Notes: None Clad Temp (°F) LICENSING BASIS Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) A. Prior ECCS Model Assessments 0 1. None 0 0 B. Planned Plant Modification Evaluations 0 1. None 0 D. Other 0 D. Other 0 I. None 0	10 CFR 50.46 MARGIN UTILIZATION - FRAMATOME FVI SMALL BREAK LOCA						
Analysis Information E EM: W&CE SBLOCA EMF-2328 Limiting Break Size: 6.5 inches Analysis Date: May 2018 Vendor: Framatome FQ: 2.5 FAH: 1.65 Fuel: Representative 17x17 Non-M5 SGTP (%): 7 Notes: None Clad Temp (°F) LICENSING BASIS Clad Temp (°F) Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) A. Prior ECCS Model Assessments 1. None 0 B. Planned Plant Modification Evaluations 0 1. None 0 D. Other 0 1. None 0	Plant	Name:	North Anna Power Station, Un	uit 2			
EM: W&CE SBLOCA EMF-2328 Limiting Break Size: 6.5 inches Analysis Date: May 2018 Vendor: Framatome FQ: 2.5 FAH: 1.65 Fuel: Representative 17x17 Non-M5 SGTP (%): 7 Notes: None LICENSING BASIS Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) A. Prior ECCS Model Assessments 1. None 0 B. Planned Plant Modification Evaluations 1. None 0 C. 2021 ECCS Model Assessments 1. None 0 D. Other 1. None 0	Utilit	y Name:	Virginia Electric and Power Co	ompany			
Analysis Date: May 2018 Vendor: Framatome FQ: 2.5 FAH: 1.65 Fuel: Representative 17x17 Non-M5 SGTP (%): 7 Notes: None Clad Temp (°F) LICENSING BASIS Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) 1801 A. Prior ECCS Model Assessments 0 1. None 0 B. Planned Plant Modification Evaluations 0 1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0	Analy	vsis Informat	ion				
Vendor: Framatome FQ: 2.5 FAH: 1.65 Fuel: Representative 17x17 Non-M5 SGTP (%): 7 Notes: None Clad Temp (°F) LICENSING BASIS Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) A. Prior ECCS Model Assessments 0 B. Planned Plant Modification Evaluations 0 0 C. 2021 ECCS Model Assessments 0 0 D. Other 0 0 D. Other 0 0	EM:	W&CE SB	LOCA EMF-2328	Limiting Bre	ak Size:	6.5 inches	
FQ: 2.5 FAH: 1.65 Fuel: Representative 17x17 Non-M5 SGTP (%): 7 Notes: None Clad Temp (°F) LICENSING BASIS Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) A Prior ECCS Model Assessments 0 B. Planned Plant Modification Evaluations 0 0 C. 2021 ECCS Model Assessments 0 0 D. Other 0 0 I. None 0 0	Analy	vsis Date:	May 2018				
Fuel: Representative 17x17 Non-M5 SGTP (%): 7 Notes: None Clad Temp (°F) LICENSING BASIS Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) 1801 A. Prior ECCS Model Assessments 0 1. None 0 B. Planned Plant Modification Evaluations 0 1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0	Vend	or:	Framatome				
Notes: None LICENSING BASIS Analysis of Record PCT Clad Temp (°F) LICENSING BASIS Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) 1801 A. Prior ECCS Model Assessments 0 1. None 0 B. Planned Plant Modification Evaluations 0 1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0	FQ:		2.5	FAH:	1.65		
LICENSING BASIS Clad Temp (°F) Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) 0 A. Prior ECCS Model Assessments 1. None 0 0 B. Planned Plant Modification Evaluations 1. None 0 0 C. 2021 ECCS Model Assessments 1. None 0 0 D. Other 1. None 1. None	Fuel:		Representative 17x17 Non-M5	SGTP (%):	7		
LICENSING BASIS Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) A. Prior ECCS Model Assessments 1. None 0 B. Planned Plant Modification Evaluations 1. None 0 C. 2021 ECCS Model Assessments 1. None 0 D. Other 1. None 0	Notes	5:	None	5			
Analysis of Record PCT 1801 PCT ASSESSMENTS (Delta PCT) 0 A. Prior ECCS Model Assessments 0 1. None 0 B. Planned Plant Modification Evaluations 0 1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0						Clad Temp (°F)	
PCT ASSESSMENTS (Delta PCT) A. Prior ECCS Model Assessments 1. None 0 B. Planned Plant Modification Evaluations 1. None 0 C. 2021 ECCS Model Assessments 1. None 0 C. 2021 ECCS Model Assessments 1. None 0 D. Other 1. None	LICE	NSING BAS	IS			and the second se	
A. Prior ECCS Model Assessments 0 1. None 0 B. Planned Plant Modification Evaluations 0 1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0		Analysis of	Record PCT			1801	
A. Prior ECCS Model Assessments 0 1. None 0 B. Planned Plant Modification Evaluations 0 1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0							
1. None 0 B. Planned Plant Modification Evaluations 0 1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0							
B. Planned Plant Modification Evaluations 1. None 0 0 C. 2021 ECCS Model Assessments 1. None 0 0 D. Other 1. None 0 0	A.	2011 - Contract - Cont				-	
1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0		1. No	ne			0	
1. None 0 C. 2021 ECCS Model Assessments 0 1. None 0 D. Other 0 1. None 0	D	Diama d Di	and Madification Frederitions				
C. 2021 ECCS Model Assessments 1. None 0 D. Other 1. None 0	Б.					0	
1.None0D.Other 1.0		1. 110	1e			0	
1.None0D.Other 1.0	С	2021 ECCS	Model Assessments				
D. Other 1. None 0						0	
1. None 0						v	
1. None 0	D.	Other					
		1. No	ne			0	
LICENSING BASIS PCT + PCT ASSESSMENTS PCT = 1801	LICE	NSING BAS	IS PCT + PCT ASSESSMENTS		PCT =	1801	

Plant Na		North Anna Power Station		
Utility N		Virginia Electric and Pow	er Company	
Analysis	Information			
EM:		ASTRUM (2004)	Limiting Break Size:	DEGB
Analysis		8/25/2010		
Vendor:		Westinghouse		
FQ:		2.32	FAH: 1.65	
Fuel:		RFA-2	SGTP (%): 7	
			17x17 RFA-2 Fuel with ZIRLOS	or Optimized ZIRLOTM
cladding, N	Non-IFBA or IFB	A, IFMs		
TIOTAC	DIG DAGIG			Clad Temp (°F)
	ING BASIS	1000		1053
1	Analysis of Re	cord PC1		1852
PCT AS	SESSMENTS	S (Delta PCT)		
		fodel Assessments		
		tion of Fuel Pellet Thermal	Conductivity	135
-	Degra		comoncurry	100
2		POT Burst Temperature Ca	Iculation	0
		RLO Cladding		-
3		ternal Pressure Calculation		0
4	HOTS	POT Iteration Algorithm fo	r Calculating the	0
		Fuel Pellet Average Tempe	-	
<u> 1</u>	. WCOI	BRA/TRAC Thermal-Hydra	ulic History File	0
	Dimen	ision used in HSDRIVER B	ackground	
	5. WCOI	BRA/TRAC Automated Res	start Process Logic Error	0
2	. Initial	Fuel Pellet Average Tempe	rature Uncertainty	1
	Calcul			
		ions for Heat Slab Tempera		0
		ransfer Model Error Correct		0
		tion to Heat Transfer Node	Initialization	0
		Conservation Error Fix		0
		tion to Split Channel Mome		0
		ransfer Logic Correction fo		0
		es to Vessel Superheated St		0
		e to Metal Density Reference		0
		Heat Model Error Correction		0 0
		tion to the Pipe Exit Pressu BRA/TRAC U19 File Dime		0
-		d Heat Transfer Multiplier 1		-27
		POT Burst Strain Error Cor		21
		es to Grid Blockage Ratio a		0
		leat Transfer Enhancement		0
		Section 7 Mid-Level Eleva		õ
		Elevation Selection	and the stand of t	õ
		in Decay Group Uncertaint	v Factors	õ
		n Oxidation Calculations	,	õ
		n use of ASME Steam Tabl	es	ō
_				

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE LARGE BREAK LOCA

LICENSING BASIS PCT + PCT ASSESSMENTS PCT = 1982						
	1.	None				
D.	Other			-		
	1.	None		0		
C.	2021	ECCS Model Assessments				
	1.	None		0		
B.	Plan	ed Plant Modification Evaluations				
	35.	Removal of the Vessel Interfacial Heat Transfer Limit		0		
	34.	Vapor Temperature Resetting		0		
	33.	Correction to Fuel Pellet TCD Assessment		0		
	32.	Steady-State Fuel Temperature Calibration Method		0		
	31.	Inappropriate Resetting of Transverse Liquid Mass Flow	V	0		
		to the Entrained Liquid / Vapor Interfacial Drag Coeffic	ient			
	30.	Inconsistent Application of Numerical Ramp Applied		0		
	29.	Support Column Core Barrel Unheated Conductor Error	15	0		

Serial No. 22-165 Docket No. 50-280/281

Attachment 4

2021 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION – SURRY POWER STATION UNITS 1 AND 2

Virginia Electric and Power Company Surry Power Station Units 1 and 2

Plant	Name:	Surry Power Station, Uni	t 1		
Utilit	y Name	: Virginia Electric and Pov	ver Company		
Anal	vsis Infe	rmation			
EM:		NOTRUMP	Limiting Break Siz	e:	2.75 inches
Anal	ysis Dat	e: 5/7/2009	-		
Vend	lor:	Westinghouse			
FQ:		2.5	FAH:	1.7	
Fuel:		Upgrade	SGTP (%):	7	
Notes	5	None			
					Clad Temp (°F)
LICE	INSING	BASIS			
	Anat	sis of Record PCT			2012
PCT	ASSES	SMENTS (Delta PCT)			
A.	Prior	ECCS Model Assessments			
	1.	Urania-Gadolinia Pellet Thermal	Conductivity Calculation	m.	0
	2.	Pellet Crack and Dish Volume Ca			0
	3.	Treatment of Vessel Average Ten	nperature Uncertainty		0
	4.	15X15 Upgrade Fuel			0
	5.	Maximum Fuel Rod Time Step L	ogic		0
	6.	Radiation Heat Transfer Logic			0
	7.	NOTRUMP-EM Evaluation of Fu	el Pellet Thermal		0
		Conductivity Degradation			
	8.	SBLOCTA Cladding Strain Requ	irement for Fuel		0
	~	Rod Burst			
	9.	Fuel Rod Gap Conductance Error			0
	10.	Radiation Heat Transfer Model Es			0
	11.	SBLOCTA Pre-DNB Cladding H	eat Transfer		0
	10	Coefficient Calculation			~
	12.	Error in the Upper Plenum Fluid	Volume Calculation		0
	13.	UO ₂ Fuel Pellet Heat Capacity			0
B.	DI	ed Plant Modification Evaluation	-		
D.	1.	None	3		0
	1.	Hone			v
C.	2021	ECCS Model Assessments			
~.	1.	Reduction in Flow Area to the Bo	ttom of the Barrel/Baff	le	0
	1.	Region	tion of the Darrer Dan	10	0
		8.0			
D.	Othe	r			
	1.	None			0
		BASIS PCT + PCT ASSESSMEN	TO	PCT =	2012

-	10 CFR 50.46	MARGIN UTILIZATION - FR	AMATOME F	VI SMA	LL BREAK LOCA
Plant	Name:	Surry Power Station, Unit 1			
Utilit	y Name:	Virginia Electric and Power C	ompany		
Analy	vsis Informati	on			
EM:	W&CE SBI	LOCA EMF-2328	Limiting Bre	ak Size:	2.6 inches
Analy	ysis Date:	July 2018			
Vend	or:	Framatome			
FQ:		2.5	FAH:	1.70	
Fuel:		Representative 15x15 Non-M5	SGTP (%):	7	
Notes		None			
					Clad Temp (°F)
LICE	INSING BASI				
	Analysis of	Record PCT			1673
non					
		ITS (Delta PCT) S Model Assessments			
А.	1. Nor				0
	1. IVOI	le			0
B.	Planned Pla	ant Modification Evaluations			
27.	1. Nor				0
					-
C.	2021 ECCS	Model Assessments			
	1. SBI	LOCA Rod History Truncation			0
	(FV	I-SBLOCA downflow baffle)			
	•	•			
D.	Other				
	1. Nor	1e			0
LICE	NSING BASIS	S PCT + PCT ASSESSMENTS		PCT =	1673

Plant Name		y Power Station, Ur			
Utility Nam	e: Virg	inia Electric and Po	ower Company		
Analysis In					
EM:		RUM (2004)	Limiting Break	Size:	DEG
Analysis Da		/2010			
Vendor:		tinghouse		NO. 10020	
FQ:	2.5		FΔH:	1.7	
Fuel:		rade	SGTP (%):	7	
Notes:	Non	e			
					Clad Temp (°F)
LICENSIN					
Ana	lysis of Record I	PCT			1853
DOT ADDE	SOLUTION OL	DOT)			
PUI ASSE	SSMENTS (Del	a PCI)			
A. Prie	r ECCS Model	Ascessments			
	a 2000 model	A MOTORIA VIELS			
1.	Evaluation of	f Fuel Pellet Therm	al Conductivity		183
	Degradation				
2.		Profile Option			-13
3.		Burst Temperature (Calculation		0
	for ZIRLO (
4.	Rod Internal	Pressure Calculatio	m		0
5.	HOTSPOT I	teration Algorithm	for Calculating the		0
		Pellet Average Tem			
6.			Iraulic History File		0
		sed in HSDRIVER			
7.			estart Process Logic	Error	0
8.		ellet Average Tem	perature Uncertainty		0
	Calculation				
9.			rature Initialization		0
10.		r Model Error Corr			0
11.		Heat Transfer Not	le Initialization		0
12. 13.		vation Error Fix	nantum Equation		0
		Split Channel Mor			
14. 15.		essel Superheated	for Rod Burst Calcula Staam Properties	AUOD	0
15.		etal Density Refere			0
10.		Model Error Correc			0
18.		the Pipe Exit Press			ő
19.			nension Error Correct	ion	õ
20.		t Transfer Multiplie		1011	-7
21.		Burst Strain Error C			51
22.		Frid Blockage Ratio			õ
23.		ansfer Enhancemer			ō
24.		on 7 Mid-Level Ele			ō
25.		ion Selection			ō
26.		cay Group Uncertai	nty Factors		4
27.		f Additional Contai			0
28.		dation Calculations			0
29.	Error in use	of ASME Steam Ta	bles		0
30.	Core Barrel	Unheated Conducto	r Errors		0

	31.	Discrepancy in Wetted Perimeter Inputs		0	
	32.	Inconsistent Application of Numerical Ramp Applied		0	
		to the Entrained Liquid / Vapor Interfacial Drag Coefficient	:		
	33.	Inappropriate Resetting of Transverse Liquid Mass Flow		0	
	34.	Steady-State Fuel Temperature Calibration Method		0	
	35.	Vapor Temperature Resetting		0	
	36.	Removal of the Vessel Interfacial Heat Transfer Limit		0	
B.	Plan	ed Plant Modification Evaluations			
	1.	None		0	
C.	2021	ECCS Model Assessments			
	1.	None		0	
D.	Othe	r			
	1.	None		0	
LICI	INSING	BASIS PCT + PCT ASSESSMENTS PC	T =	2071	

IUCF	R 50.46	MARGIN UTILIZAT	ION - WESTINGHOUSE SM	MALL BI	REAK LOCA
Plant	Name:				
Utility	Name:				
Analy	sis Info	mation			
EM:		NOTRUMP	Limiting Break	Size:	2.75 inches
Analy	sis Date	: 5/7/2009	_		
Vendo	or:	Westinghouse			
FQ:		2.5	FAH:	1.7	
Fuel:		Upgrade	SGTP (%):	7	
Notes:		None			
					Clad Temp (°F)
LICE	NSING				
	Analy	sis of Record PCT			2012
DOT /	OCTOC	MENTS (D.K. DOT)			
PCI A A.		MENTS (Delta PCT) ECCS Model Assessme			
13.	1.		nus t Thermal Conductivity Calcu	lation	0
	2.	Pellet Crack and Dish	-	uanon.	0
	2. 3.			•••	17.
			verage Temperature Uncertain	пу	0
	4. 5.	15X15 Upgrade Fuel			0
		Maximum Fuel Rod T			0
	6. 7	Radiation Heat Transf	ation of Fuel Pellet Thermal		0
	7.	Conductivity Degrada			U
	8.		train Requirement for Fuel		0
	0.	Rod Burst	tain Requirement for Poer		U
	9.	Fuel Rod Gap Conduc	ance Error		0
	10.	Radiation Heat Transf			õ
	11.		Cladding Heat Transfer		0
	•••	Coefficient Calculation			
	12.		um Fluid Volume Calculation	ı	0
	13.	UO2 Fuel Pellet Heat		-	ō
B.	Plann	ed Plant Modification]	valuations		
	1.	None			0
C.	2021 1	CCS Model Assessme	its		
	1.		a to the Bottom of the Barrel/I	Baffle	0
		Region			-
D.	Other				
	1.	None			0
		-			
		BASIS PCT + PCT AS			and the second sec

10 CFR 50.	46 MARGIN UTILIZATION - FR	AMATOME F	VI SMA	LL BREAK LOCA
Plant Name:	Surry Power Station, Unit 2			
Utility Name:	Virginia Electric and Power Co	ompany		
Analysis Informa	ation			
EM: W&CE SI	BLOCA EMF-2328	Limiting Brea	ak Size:	2.6 inches
Analysis Date:	July 2018	-		
Vendor:	Framatome			
FO:	2.5	FAH:	1.70	
Fuel:	Representative 15x15 Non-M5	SGTP (%):	7	
Notes:	None	····		
				Clad Temp (°F)
LICENSING BA	SIS			
Analysis o	of Record PCT			1673
A. Prior EC	ENTS (Delta PCT) CS Model Assessments one			0
	Plant Modification Evaluations one			0
1. SI	CS Model Assessments BLOCA Rod History Truncation VI-SBLOCA downflow baffle)			0
D. Other				
1. N	one			0
LICENSING BAS	SIS PCT + PCT ASSESSMENTS		PCT =	1673

	10 CF	R 50.46 MARGIN UTILIZATION - WESTINGHOUSE LAF	RGE BREAK LOCA
	Name:	Surry Power Station, Unit 2	
Utilit	y Name	: Virginia Electric and Power Company	
Analy	vsis Info	rmation	
EM:		ASTRUM (2004) Limiting Break Size:	DEG
Analy	ysis Dat	e: 10/6/2010	
Vend	or:	Westinghouse	
FQ:		2.5 FAH: 1.7	
Fuel:		Upgrade SGTP (%): 7	
Notes	:		
			Clad Temp (°F)
LICE		BASIS	1853
	Analy	vsis of Record PCT	1655
PCT	ASSES	SMENTS (Delta PCT)	
A.		ECCS Model Assessments	
	1.	Evaluation of Fuel Pellet Thermal Conductivity	183
	~	Degradation	
	2.	Pellet Radial Profile Option	-13
	3.	HOTSPOT Burst Temperature Calculation	0
		for ZIRLO Cladding	•
	4.	Rod Internal Pressure Calculation	0
	5.	HOTSPOT Iteration Algorithm for Calculating the	0
		Initial Fuel Pellet Average Temperature	•
	б.	WCOBRA/TRAC Thermal-Hydraulic History File	0
	7	Dimension used in HSDRIVER Background	0
	7.	WCOBRA/TRAC Automated Restart Process Logic Error	0
	8.	Initial Fuel Pellet Average Temperature Uncertainty Calculation	0
	9.		0
	9. 10.	Elevations for Heat Slab Temperature Initialization Heat Transfer Model Error Corrections	0
	11.	Correction to Heat Transfer Node Initialization	0
	12.	Mass Conservation Error Fix	0
	13.	Correction to Split Channel Momentum Equation	ő
	14.	Heat Transfer Logic Correction for Rod Burst Calculation	0
	15.	Changes to Vessel Superheated Steam Properties	õ
	16.	Update to Metal Density Reference Temperatures	0 0
	17.	Decay Heat Model Error Corrections	0
	18.	Correction to the Pipe Exit Pressure Drop Error	0
	19.	WCOBRA/TRAC U19 File Dimension Error Correction	0
	20.	Revised Heat Transfer Multiplier Distributions	-7
	20.	HOTSPOT Burst Strain Error Correction	51
	22.	Changes to Grid Blockage Ratio and Porosity	0
	23.	Grid Heat Transfer Enhancement Calculation	õ
	24.	Vessel Section 7 Mid-Level Elevation Modeling	õ
	25.	Burst Elevation Selection	0
	26.	Errors in Decay Group Uncertainty Factors	4
	27.	Evaluation of Additional Containment Metal	0
	28.	Error in Oxidation Calculations	0
	20. 29.	Error in use of ASME Steam Tables	0
	47.		
	30.	Core Barrel Unheated Conductor Errors	0

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE LARGE BREAK LOCA

	32.	Inconsistent Application of Numerical Ramp Applied		0	
		to the Entrained Liquid / Vapor Interfacial Drag Coeffic		-	
	33.	Inappropriate Resetting of Transverse Liquid Mass Flow	V	0	
	34.	Steady-State Fuel Temperature Calibration Method		0	
	35.	Vapor Temperature Resetting		0	
	36.	Removal of the Vessel Interfacial Heat Transfer Limit		0	
B.	Plann	ed Plant Modification Evaluations			
	1.	None		0	
C.	2021 1	CCS Model Assessments			
	1.	None		0	
D.	Other				
	1.	None		0	
LICH	INSING	BASIS PCT + PCT ASSESSMENTS	PCT =	2071	

Serial No. 22-165 Docket No. 50-395

Attachment 5

2021 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION – VIRGIL C. SUMMER NUCLEAR STATION

Dominion Energy South Carolina, Inc. Virgil C. Summer Nuclear Station Unit 1

10 CFR 50.4	6 Margin Utilization – Appendix K Sı	nall Break	
Plant Name			
Utility Nam	: Dominion Energy South Carolina	L	
Analysis Inf	ormation		
EM:		iting Break Size:	3 Inch
Analysis Da	e: February 2003		
Vendor:	Westinghouse		
FQ:	2.45 EdH	; 1.62	
Notes:	None		
			Clad Temp(°F)
LICENSING			
Anal	ysis of Record PCT		1775
DOT AGGES	SMENTS (Date BCT)		
	SMENTS (Delta PCT) • ECCS Model Assessments		
L 110	LCCO Model Assessments		
1.	NOTRUMP-EM Refined Break Spect	um	0
2.	Errors in Reactor Vessel Nozzle Data		ō
3.	Pump Weir Resistance Modeling		ō
4	Errors in Reactor Vessel Lower Plenu	m Surface	<u> </u>
	Area Calculations		0
5.	Modeling of Annular Pellets		0
6.	Discrepancy in Metal Masses Used E	rom Drawings	0
7.	V. C. Summer Upflow Conversion		148
8.	Treatment of Vessel Average Temperatur	e Uncertainty	0
9.	Urania-Gadolinia Pellet Thermal Conduc		
	Calculation	-	0
10.	Pellet Crack and Dish Volume Calculatio	n	0
11.	Radiation Heat Transfer Logic		0
12.	Maximum Fuel Rod Time Step Logic		0
13.	NOTRUMP-EM Evaluation of Fuel Pelle	t Thermal	
	Conductivity Degradation		0
14.	SBLOCTA Cladding Strain Requirement	for Fuel	
	Rod Burst		0
15.	Fuel Rod Gap Conductance Error		0
16.	Radiation Heat Transfer Model Error		0
17.	SBLOCTA Pre-DNB Cladding Surface E	leat Transfer	-
	Coefficient Calculation		0
18.	Control Rod Drop Time Technical Specif		0
19.	Vessel Average Temperature Uncertainty		0
20.	Error in the Upper Plenum Fluid Volume	Calculation	0
21.	UO2 Fuel Pellet Heat Capacity		0
22.	Increased Vessel Average Temperature U	ncertainty	0
B. Plan	ned Plant Modification Evaluations		
1.	None		0
C. 2021	ECCS Model Assessments		
C. 2021 1.	Reduction in Flow Area to the Bottom of	the Barrel/Daffla	0
1.		me Daner Dame	v
	Region		

10 CFR 50.46 Margin Utilization - Appendix K Small Break

Serial No. 22-165 Docket No. 50-395 Attachment 5: Page 2 of 12

D.	Other 1.	None		0	
LICE	NSING	BASIS PCT + PCT ASSESSMENTS	PCT =	1923	

Plant Name:	V. C. Summer			
Utility Name:	Dominion Energy So	uth Carolina		
Analysis Informa	tion			
EM:	FSLOCA	Limiting Br	eak Size:	2.6 Inch
Analysis Date:	January 2019			
Vendor:	Westinghouse			
FQ:	2.5	EdH:	1.70	
Notes:	None			
				Clad Temp(°F)
LICENSING BA				
	of Record PCT			1108
(Including	g gamma energy redistribution	on)		
	INTS (Delta PCT)			
A. Prior EC	CS Model Assessments			_
A. Prior EC				0
A. Prior EC 1. N	CS Model Assessments one	tions		0
A. Prior EC 1. N B. Planned I	CS Model Assessments one Plant Modification Evalua	tions		
A. Prior EC 1. N B. Planned I	CS Model Assessments one	tions		0 0
A. Prior EC 1. N B. Planned I 1. N	CS Model Assessments one Plant Modification Evalua	tions		
A. Prior EC 1. N B. Planned I 1. N C. 2021 ECC	CS Model Assessments one Plant Modification Evaluatione	tions		
A. Prior EC 1. N B. Planned I 1. N C. 2021 ECC	CS Model Assessments one Plant Modification Evaluat one CS Model Assessments	tions		0
 A. Prior EC 1. N B. Planned I 1. N C. 2021 ECO 1. N 	CS Model Assessments one Plant Modification Evaluat one CS Model Assessments	tions		0
 A. Prior EC 1. N B. Planned I 1. N C. 2021 ECO 1. N D. Other 	CS Model Assessments one Plant Modification Evaluat one CS Model Assessments	tions		0
 A. Prior EC 1. N B. Planned I 1. N C. 2021 ECO 1. N D. Other 	CS Model Assessments one Plant Modification Evaluation one CS Model Assessments one	tions		0

Plant Name:		
Utility Name	: Dominion Energy South Carolina	
Analysis Info		
EM:	CQD (1996) Limiting Break Size:	DEGB
Analysis Dat	e: February 2003	
Vendor:	Westinghouse	
FQ:	2.5 EdH: 1.7	
Notes:	None	
		Clad Temp(°F)
LICENSING	and the second sec	
Analy	ysis of Record PCT	1860
	SMENTS (Delta PCT)	
A. Prior	ECCS Model Assessments	
	En Conto Defermente La contra	0
1.	Fan Cooler Performance Increase	0
2.	Improved Automation of End of Blowdown Time	0
3.	Implementation of ASTRUM Capability in HOTSPOT	0
4	Revised Blowdown Heatup Uncertainty Distribution	49
5.	Revised Iteration Algorithm for Calculating	~
	The Average Fuel Temperature	0
6.	Improved Automation of End of Blowdown Time	0
7.	Thermodynamic Properties from Thermo	0
8.	Pressurizer Fluid Volumes	0
9.	Vessel Unheated Conductor Noding	0
10.	Containment Relative Humidity Assumption	0
11.	HOTSPOT Fuel Relocation	0
12.	Steam Generator Nozzle Volume Accounting Error	0
13.	Cold Leg Volume Discrepancy	0
14.	Errors in Reactor Vessel Nozzle Data Collection	0
15.	HOTSPOT Burst Temperature Logic Errors	0
16.	V. C. Summer Upflow Conversion	-7
17.	Zero Cross-Flow Boundary Condition Error	0
18.	Discrepancy in Metal Masses Used From Drawings	0
19.	HOTSPOT Gap Heat Transfer Logic	0
20.	HOTSPOT Statistical Output Logic	0
21.	Treatment of Vessel Average Temperature Uncertainty	0
22.	Additional Heat Sinks and Maximum Spray Flow	0
23.	Fuel Pellet Thermal Conductivity Degradation	
	and Peaking Factor Burndown	0
24.	PAD 4.0 Implementation	-83
25.	Zero Cross-Flow Boundary Condition Error	0
26.	HOTSPOT Burst Temperature Calculation	
	For ZIRLO Cladding	0
27.	HOTSPOT Iteration Algorithm for Calculating	
	The Initial Fuel Pellet Average Temperature	0
28.	WCOBRA/TRAC Automated Restart Process Logic Error	0
29.	Rod Internal Pressure Calculation	0
30.	WCOBRA/TRAC Thermal-Hydraulic History File	
	Dimension used in HSDRIVER	0
	Dimension used in HSL/K1VEK	v
31.	Burst Elevation Selection	ŏ

LICE	INSING	BASIS PCT + PCT ASSESSMENTS PCT =	1814	
	1.	None	0	
D.	Other		_	
	1.	None	0	
C.	2021	ECCS Model Assessments		
~,	1.	None	0	
B.	Plann	ed Plant Modification Evaluations		
	56.	Increased Vessel Average Temperature Uncertainty	0	
	55.	Removal of the Vessel Interfacial Heat Transfer Limit	0	
	54.	Vapor Temperature Resetting	0	
	53.	Inappropriate Resetting of Transverse Liquid Mass Flow	0	
	52.	Numerical Ramp Entrained Liquid/Vapor Interfacial Drag	ō	
	51.	Vessel Average Temperature Uncertainty	ō	
	50.	Support Column Unheated Conductor Error	õ	
	49.	Error in Oxidation Calculations	0	
	40.	Simulations	0	
	47. 48.	Code Uncertainty in BE LBLOCA Monte Carlo	v	
	40.	Error in Burst Strain Application	0	
	45. 46.	Revised Heat Transfer Multiplier Distributions Changes to Grid Blockage Ratio and Porosity	0	
	44. 45.		0 -5	
	43.	Vessel Section 7 Mid-Level Elevation Modeling Grid Heat Transfer Enhancement Calculation	0	
	42.	Correction to the Pipe Exit Pressure Drop Error	0	
	41	Decay Heat Model Error Correction	0	
	40.	Update to Metal Density Reference Temperatures	0	
	39.	Changes to Vessel Superheated Steam Properties	0	
	38.	Correction to Split Channel Momentum Equation	0	
	37.	Mass Conservation Error Fix	0	
	36.	Correction to Heat Transfer Node Initialization	0	
	35.	Heat Transfer Model Error Corrections	0	
	34.	WCOBRA/TRAC U19 File Dimension Error Correction	0	
	33.	Heat Transfer Logic for Rod Burst Calculation	0	

Plant Name:		
Utility Name		
Analysis Info		DECD
EM:	CQD (1996) Limiting Break Size:	DEGB
Analysis Dat		
Vendor:	Westinghouse 2.5 FdH: 1.1	7
FQ:	Contract	1
Notes:	None	Clad Temp(°F
LICENSING	BASIS	Clau rempt r
Anat	ysis of Record PCT	1808
PCT ASSES	SMENTS (Delta PCT)	
	r ECCS Model Assessments	
A. 110	ECCS Model Assessments	
1.	Fan Cooler Performance Increase	1
2.	Improved Automation of End of Blowdown Time	0
3.	Implementation of ASTRUM Capability in HOTSPOT	0
3. 4	Revised Blowdown Heatup Uncertainty Distribution	5
5.	Revised Blowdown Health OnCalculating Revised Iteration Algorithm for Calculating	,
5.	The Average Fuel Temperature	0
6.	Improved Automation of End of Blowdown Time	0
0. 7.	Thermodynamic Properties from Thermo	0
8.	Pressurizer Fluid Volumes	0
		_
9.	Vessel Unheated Conductor Noding	0
10.	Containment Relative Humidity Assumption	0
11.	HOTSPOT Fuel Relocation	0
12.	Steam Generator Nozzle Volume Accounting Error	0
13.	Cold Leg Volume Discrepancy	0
14.	Errors in Reactor Vessel Nozzle Data Collection	0
15.	HOTSPOT Burst Temperature Logic Errors	0
16.	V. C. Summer Upflow Conversion	-44
17.	Zero Cross-Flow Boundary Condition Error	0
18.	Discrepancy in Metal Masses Used From Drawings	0
19.	HOTSPOT Gap Heat Transfer Logic	0
20.	HOTSPOT Statistical Output Logic	0
21.	Treatment of Vessel Average Temperature Uncertainty	0
22.	Additional Heat Sinks and Maximum Spray Flow	0
23.	Fuel Pellet Thermal Conductivity Degradation	
	and Peaking Factor Burndown	113
24.	PAD 4.0 Implementation	-118
25.	Zero Cross-Flow Boundary Condition Error	0
26.	HOTSPOT Burst Temperature Calculation	_
	For ZIRLO Cladding	0
27.	HOTSPOT Iteration Algorithm for Calculating	
800 da 5218	The Initial Fuel Pellet Average Temperature	0
28.	WCOBRA/TRAC Automated Restart Process Logic Error	0
29.	Rod Internal Pressure Calculation	0
30.	WCOBRA/TRAC Thermal-Hydraulic History File	27
	Dimension used in HSDRIVER	0
31.	Burst Elevation Selection	0
32.	Elevation for Heat Slab Temperature Initialization	0

LICI	INSING	BASIS PCT + PCT ASSESSMENTS PCT =	1814	
D.	Other 1.	None	0	
ъ	0.1			
C.	2021	ECCS Model Assessments None	0	
~			•	
B.	Plann 1.	ed Plant Modification Evaluations None	0	
	56.	Increased Vessel Average Temperature Uncertainty	õ	
	55.	Removal of the Vessel Interfacial Heat Transfer Limit	ő	
	54.	Vapor Temperature Resetting	0 0	
	53.	Inappropriate Resetting of Transverse Liquid Mass Flow	0	
	51. 52.	Vessel Average Temperature Uncertainty Numerical Ramp Entrained Liquid/Vapor Interfacial Drag	0	
	50. 51.	Support Column Unheated Conductor Error	0	
	49. 50.	Error in Oxidation Calculations	.0	
	10	Simulations	0	
	48.	Code Uncertainty in BE LBLOCA Monte Carlo		
	47.	Error in Burst Strain Application	20	
	46.	Changes to Grid Blockage Ratio and Porosity	24	
	45.	Revised Heat Transfer Multiplier Distributions	5	
	44.	Grid Heat Transfer Enhancement Calculation	0	
	43.	Vessel Section 7 Mid-Level Elevation Modeling	0	
	42.	Correction to the Pipe Exit Pressure Drop Error	0	
	41.	Decay Heat Model Error Correction	0	
	40.	Update to Metal Density Reference Temperatures	0	
	39.	Changes to Vessel Superheated Stearn Properties	0	
	38.	Correction to Split Channel Momentum Equation	0	
	37.	Mass Conservation Error Fix	0	
	36.	Correction to Heat Transfer Node Initialization	0	
	35.	Heat Transfer Model Error Corrections	ō	
	34.	WCOBRA/TRAC U19 File Dimension Error Correction	0	
	33.	Heat Transfer Logic for Rod Burst Calculation	0	

10 CI	FR 50.4	6 Margin Utilization Best Estimate Large Break, REF	LOOD 2
Plant	t Name:	V. C. Summer	
Utilit	ty Name	: Dominion Energy South Carolina	
Anal	ysis Info	rmation	
EM:		CQD (1996) Limiting Break Size:	DEGB
Anah	ysis Dat		
Vend	lor:	Westinghouse	
FQ:		2.5 EdH: 1.7	
Notes	s:	None	
			Clad Temp(°F)
LICE	INSING	BASIS	-1 Ac
	Analy	vsis of Record PCT	1988
	-		
PCT	ASSES	SMENTS (Delta PCT)	
A.	Prior	ECCS Model Assessments	
	1.	Fan Cooler Performance Increase	2
	2.	Improved Automation of End of Blowdown Time	0
	3.	Implementation of ASTRUM Capability in HOTSPOT	0
	4	Revised Blowdown Heatup Uncertainty Distribution	5
	5.	Revised Iteration Algorithm for Calculating	
		The Average Fuel Temperature	0
	6.	Improved Automation of End of Blowdown Time	0
	7.	Thermodynamic Properties from Thermo	0
	8.	Pressurizer Fluid Volumes	0
	9.	Vessel Unheated Conductor Noding	0
	10.	Containment Relative Humidity Assumption	0
	11.	HOTSPOT Fuel Relocation	0
	12.	Steam Generator Nozzle Volume Accounting Error	0
	13.	Cold Leg Volume Discrepancy	0
	14.	Errors in Reactor Vessel Nozzle Data Collection	0
	15.	HOTSPOT Burst Temperature Logic Errors	0
	16.	V. C. Summer Upflow Conversion	-29
	17.	Zero Cross-Flow Boundary Condition Error	0
	18.	Discrepancy in Metal Masses Used From Drawings	0
	19.	HOTSPOT Gap Heat Transfer Logic	0
	20.	HOTSPOT Statistical Output Logic	0
	21.	Treatment of Vessel Average Temperature Uncertainty	0
	22.	Additional Heat Sinks and Maximum Spray Flow	1
	23.	Fuel Pellet Thermal Conductivity Degradation	122
	24	and Peaking Factor Burndown	123
	24. 25.	PAD 4.0 Implementation	-118 0
	26.	Zero Cross-Flow Boundary Condition Error	0
	20.	HOTSPOT Burst Temperature Calculation	0
	27.	For ZIRLO Cladding	0
	41.	HOTSPOT Iteration Algorithm for Calculating The Initial Fuel Pellet Average Temperature	0
	28.	WCOBRA/TRAC Automated Restart Process Logic Error	0
	29.	Rod Internal Pressure Calculation	0
	30.	WCOBRA/TRAC Thermal-Hydraulic History File	v
	50.	Dimension used in HSDRIVER	0
	31.	Burst Elevation Selection	0
	32.	Elevation for Heat Slab Temperature Initialization	0
	22.		v

REELOOD 3

LICI	ENSING	BASIS PCT + PCT ASSESSMENTS PCT =	1961	
	1.	None	0	
D.	Othe	-		
	1.	None	0	
C.		ECCS Model Assessments		
	1.	None	0	
B.	Plan	ed Plant Modification Evaluations		
	56.	Increased Vessel Average Temperature Uncertainty	0	
	55.	Removal of the Vessel Interfacial Heat Transfer Limit	0	
	54.	Vapor Temperature Resetting	0	
	53.	Inappropriate Resetting of Transverse Liquid Mass Flow	0	
	52.	Numerical Ramp Entrained Liquid/Vapor Interfacial Drag	0	
	51.	Vessel Average Temperature Uncertainty	0	
	50.	Support Column Unheated Conductor Error	0	
	49.	Error in Oxidation Calculations	0	
		Simulations	0	
	48.	Code Uncertainty in BE LBLOCA Monte Carlo		
	47.	Error in Burst Strain Application	0	
	46.	Changes to Grid Blockage Ratio and Porosity	24	
	45.	Revised Heat Transfer Multiplier Distributions	-35	
	44.	Grid Heat Transfer Enhancement Calculation	õ	
	43.	Vessel Section 7 Mid-Level Elevation Modeling	ů 0	
	42.	Correction to the Pipe Exit Pressure Drop Error	0 0	
	40.	Update to Metal Density Reference Temperatures Decay Heat Model Error Corrections	0	
	39. 40.	Changes to Vessel Superheated Steam Properties	0	
	38.	Correction to Split Channel Momentum Equation	0	
	37.	Mass Conservation Error Fix	0	
	36.	Correction to Heat Transfer Node Initialization	0	
	35.	Heat Transfer Model Error Corrections	0	
	34.	WCOBRA/TRAC U19 File Dimension Error Correction	0	

	Name:		POSITE
	y Name		
		armation	
EM:		CQD (1996) Limiting Break Size:	DEGB
	ysis Dat		DLOD
Vend		Westinghouse	
FQ:		2.5 EdH: 1.7	
Notes		None	
THURCA		Rolic	Clad Town/9E)
LICE	INSING	BASIS	Clad Temp(°F)
DICL		vsis of Record PCT	1988
	2 tittin		1500
PCT	ASSES	SMENTS (Delta PCT)	
A.		ECCS Model Assessments	
	1.	Fan Cooler Performance Increase	2
	2.	Improved Automation of End of Blowdown Time	ō
	3.	Implementation of ASTRUM Capability in HOTSPOT	ō
	4	Revised Blowdown Heatup Uncertainty Distribution	5
	5.	Revised Iteration Algorithm for Calculating	
		The Average Fuel Temperature	0
	6.	Improved Automation of End of Blowdown Time	0
	7.	Thermodynamic Properties from Thermo	0
	8.	Pressurizer Fluid Volumes	0
	9.	Vessel Unheated Conductor Noding	0
	10.	Containment Relative Humidity Assumption	0
	11.	HOTSPOT Fuel Relocation	0
	12.	Steam Generator Nozzle Volume Accounting Error	0
	13.	Cold Leg Volume Discrepancy	0
	14.	Errors in Reactor Vessel Nozzle Data Collection	0
	15.	HOTSPOT Burst Temperature Logic Errors	0
	16.	V. C. Summer Upflow Conversion	-29
	17.	Zero Cross-Flow Boundary Condition Error	0
	18.	Discrepancy in Metal Masses Used From Drawings	0
	19.	HOTSPOT Gap Heat Transfer Logic	0
	20.	HOTSPOT Statistical Output Logic	0
	21.	Treatment of Vessel Average Temperature Uncertainty	0
	22.	Additional Heat Sinks and Maximum Spray Flow	1
	23.	Fuel Pellet Thermal Conductivity Degradation	44-
	<u>.</u>	and Peaking Factor Burndown	123
	24.	PAD 4.0 Implementation	-118
	25.	Zero Cross-Flow Boundary Condition Error	0
	26.	HOTSPOT Burst Temperature Calculation	
		For ZIRLO Cladding	0
	27.	HOTSPOT Iteration Algorithm for Calculating	
	30	The Initial Fuel Pellet Average Temperature	0
	28.	WCOBRA/TRAC Automated Restart Process Logic Error	0
	29.	Rod Internal Pressure Calculation	0
	30.	WCOBRA/TRAC Thermal-Hydraulic History File	0
	21	Dimension used in HSDRIVER	0
	31.	Burst Elevation Selection	0
	32.	Elevation for Heat Slab Temperature Initialization	0

10 CFR 50.46 Margin Utilization -- Best Estimate Large Break, COMPOSITE

LICI	INSING	BASIS PCT + PCT ASSESSMENTS PCT =	1961	
D.	Other 1.	None	0	
	1.	None	0	
C.	2021 1	ECCS Model Assessments		
В.	Plann 1.	ed Plant Modification Evaluations None	0	
	<i>.</i>	increased vesser Average remperature Oncertainty	0	
	54. 55.	Increased Vessel Average Temperature Uncertainty	0	
	53. 54.	Vapor Temperature Resetting Removal of the Vessel Interfacial Heat Transfer Limit	0	
	52. 53.	Inappropriate Resetting of Transverse Liquid Mass Flow	0	
	51.	Numerical Ramp Entrained Liquid/Vapor Interfacial Drag	0	
	50.	Vessel Average Temperature Uncertainty	0	
	49.	Support Column Unheated Conductor Error	0	
	48.	Error in Oxidation Calculations	0	
		Simulations	0	
	47.	Code Uncertainty in BE LBLOCA Monte Carlo		
	46.	Error in Burst Strain Application	0	
	45.	Changes to Grid Blockage Ratio and Porosity	24	
	44.	Revised Heat Transfer Multiplier Distributions	-35	
	43.	Grid Heat Transfer Enhancement Calculation	0	
	42.	Vessel Section 7 Mid-Level Elevation Modeling	0	
	41.	Correction to the Pipe Exit Pressure Drop Error	Ō	
	41.	Decay Heat Model Error Correction	Ō	
	40.	Update to Metal Density Reference Temperatures	õ	
	39.	Changes to Vessel Superheated Steam Properties	õ	
	38.	Correction to Split Channel Momentum Equation	ŏ	
	37.	Mass Conservation Error Fix	ŏ	
	36.	Correction to Heat Transfer Node Initialization	0	
	34. 35.	WCOBRA/TRAC U19 File Dimension Error Correction Heat Transfer Model Error Corrections	0	
	33.	Heat Transfer Logic for Rod Burst Calculation	0	
	22	Uast Transfer Logis for Dad Durat Calminian	0	

1 10111 1/0	me:	V. C. Summer		a factor of the	
Utility N	ame:	Dominion Energy South C	arolina		
Analysis	Information				
EM:		FSLOCA	Limiting B	eak Size:	DEGB
Analysis	Date:	January 2019	_		
Vendor:		Westinghouse			
FQ:		2.5	EdH:	1.70	
Notes:		None			
					Clad Temp(°F)
	ING BASIS				
	Analysis of Re				1879
(1	Including gam	ma energy redistribution)			
DOTE A CO					
		(Delta PCT)			
A. P	rior ECCS M	(Delta PC1) Iodel Assessments			<u>,</u>
	rior ECCS M				0
A. P 1	rior ECCS M	Iodel Assessments			0
A. P 1 B. P	Prior ECCS M None				
A. P 1	Prior ECCS M None	Iodel Assessments			0 0
A. P 1 B. P 1	Prior ECCS N None Planned Plant None	Iodel Assessments Modification Evaluations			
A. P 1 B. P 1	Prior ECCS M None Planned Plant None 021 ECCS M	Iodel Assessments			
A. P 1 B. P 1 C. 2	Prior ECCS M None Planned Plant None 021 ECCS M	Iodel Assessments Modification Evaluations			0
A. P 1 B. F 1 C. 2 1	Prior ECCS M None Planned Plant None 021 ECCS M	Iodel Assessments Modification Evaluations			0
A. P 1 B. F 1 C. 2 1	Prior ECCS N None Planned Plant None 021 ECCS M None Other	Iodel Assessments Modification Evaluations			0
A. P 1 B. P 1 C. 2 1 D. C	Prior ECCS N None Planned Plant None 021 ECCS M None Other	Iodel Assessments Modification Evaluations			0 0

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