Dominion Energy Services, Inc. 5000 Dominion Boulevard, Glen Allen, VA 23060 DominionEnergy.com



June 27, 2017

U.S. Nuclear Regulatory Commission Attention: Document Control Desk Washington, DC 20555 Serial No.: 17-264 NRA/GDM R1 Docket Nos.: 50-336/423 50-338/339 50-280/281 License Nos.: DPR-65/NPF-49 NPF-4/7 DPR-32/37

DOMINION NUCLEAR CONNECTICUT, INC. VIRGINIA ELECTRIC AND POWER COMPANY MILLSTONE POWER STATION UNITS 2 AND 3 NORTH ANNA POWER STATION UNITS 1 AND 2 SURRY POWER STATION UNITS 1 AND 2 2016 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 Nuclear Connecticut, Inc. and Virginia Electric and Power Company hereby submit the annual summary of permanent changes to the emergency core cooling system (ECCS) evaluation models for Millstone Power Station (MPS) Units 2 and 3, North Anna Power Station (NAPS) Units 1 and 2, and Surry Power Station (SPS) Units 1 and 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 MPS 2 and 3, NAPS 1 and 2, and SPS 1 and 2, as applicable.

Information regarding the effect of the ECCS evaluation model changes upon the reported SBLOCA and LBLOCA analyses of record results is provided for MPS 2 and 3, NAPS 1 and 2, and SPS 1 and 2 in Attachments 2, 3 and 4, respectively. The calculated peak cladding temperatures (PCT) for the SBLOCA and LBLOCA analyses for MPS 2 and 3, NAPS 1 and 2, and SPS 1 and 2 are summarized below:

Millstone Unit 2	Small break - AREVA Evaluation Model:	1711°F
Millstone Unit 2	Large break - AREVA Evaluation Model:	1845°F
Millstone Unit 3	Small break - Westinghouse Evaluation Model:	1193°F
Millstone Unit 3	Large break - Westinghouse Evaluation Model:	1933°F
North Anna Unit 1	Small break - Westinghouse Evaluation Model:	1834.1°F
North Anna Unit 1	Large break - Westinghouse Evaluation Model:	1982°F
North Anna Unit 2	Small break - Westinghouse Evaluation Model:	1834.1°F
North Anna Unit 2	Large break - Westinghouse Evaluation Model:	1982°F
Surry Units 1 and 2	Small break - Westinghouse Evaluation Model:	2012°F
Surry Units 1 and 2	Large break - Westinghouse Evaluation Model:	2071°F

ADDL

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

The information contained herein satisfies the 2016 annual reporting requirements of 10 CFR 50.46(a)(3)(ii).

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

Respectfully,

Mar Sail -

Mark D. Sartain Vice President - Nuclear Engineering and Fleet Support Dominion Nuclear Connecticut, Inc. Virginia Electric and Power Company

Commitments made in this letter: None

Attachments:

- 1. Report of Changes in AREVA and Westinghouse ECCS Evaluation Models
- 2. 2016 Annual Reporting of 10 CFR 50.46 Margin Utilization Millstone Power Station Units 2 and 3
- 3. 2016 Annual Reporting of 10 CFR 50.46 Margin Utilization North Anna Power Station Units 1 and 2
- 4. 2016 Annual Reporting of 10 CFR 50.46 Margin Utilization Surry Power Station Units 1 and 2

cc: U. S. Nuclear Regulatory Commission, Region I Regional Administrator 2100 Renaissance Blvd., Suite 100 King of Prussia, PA 19406-2713

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

NRC Senior Resident Inspector Millstone Power Station

NRC Senior Resident Inspector North Anna Power Station

NRC Senior Resident Inspector Surry Power Station

Mr. J. R. Hall NRC Senior Project Manager - North Anna U. S. Nuclear Regulatory Commission One White Flint North Mail Stop O8 G-9A 11555 Rockville Pike Rockville, MD 20852-2738

Mr. R. Guzman NRC Senior Project Manager - Millstone Units 2 and 3 U. S. Nuclear Regulatory Commission One White Flint North Mail Stop O8 C-2 11555 Rockville Pike Rockville, MD 20852-2738

Ms. K. R. Cotton Gross NRC Project Manager - Surry U. S. Nuclear Regulatory Commission One White Flint North Mail Stop O8 G-9A 11555 Rockville Pike Rockville, MD 20852-2738

Mr. J. E. Reasor, Jr. Old Dominion Electric Cooperative Innsbrook Corporate Center, Suite 300 4201 Dominion Blvd. Glen Allen, Virginia 23060

Serial No. 17-264 Docket Nos. 50-336/423/338/339/280/281

Attachment 1

2016 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

REPORT OF CHANGES IN AREVA AND WESTINGHOUSE ECCS EVALUATION MODELS

DOMINION NUCLEAR CONNECTICUT, INC. VIRGINIA ELECTRIC AND POWER COMPANY 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 AREVA AND WESTINGHOUSE ECCS EVALUATION MODELS

Millstone Power Station Unit 2

- 1. AREVA identified no changes or errors applicable to the 2002 S-RELAP5 based Small Break LOCA (SBLOCA) Evaluation Model for Millstone Unit 2 during 2016. This was the analysis of record in 2016 until the implementation of License Amendment 329 with the new SBLOCA analysis described in Item #2 below.
- On September 30, 2016, a new SBLOCA analysis was approved by the NRC based upon EMF-2328(P)(A), Revision 0 with Supplement 1. That analysis was performed in support of introduction of the AREVA Standard CE14 HTP fuel product with M5[™] fuel rod cladding. The new limiting break size resulted in a peak clad temperature (PCT) of 1707°F. Additionally, results were presented for the current fuel product with Zircaloy-4 (Zr-4) cladding. The Zr-4 necessitated a 4°F PCT penalty.
- 3. AREVA identified no changes or errors applicable to the SEM/PWR-98 evaluation model for Large Break LOCA (LBLOCA) for Millstone Unit 2 during 2016.
- 4. 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 Methodology for Pressurized Water Reactors. The new analysis was applicable to the AREVA Standard CE14 HTP fuel product with M5[™] fuel rod cladding only. The analysis predicted a PCT of 1615°F. As this fuel type will not be included in the Millstone 2 core until the spring of 2017, the margin utilization table for the realistic LBLOCA analysis is not included in this 2016 annual report.

Millstone Power Station (Millstone) Unit 3

- 1. Westinghouse identified no changes or errors to the 1985 Westinghouse SBLOCA Evaluation Model with NOTRUMP for Millstone Unit 3 during 2016.
- Westinghouse identified the following changes and errors applicable to the 2004 Westinghouse Best Estimate (BE) LBLOCA Evaluation Model using the Automated Statistical Treatment of Uncertainty Method (ASTRUM) for Millstone Unit 3 during 2016:
 - General Code Maintenance. Various changes have been made to enhance the usability of codes and to streamline future analyses. Examples of these changes include modifying input variable definitions, units and defaults; improving the input diagnostic checks; enhancing the code output; optimizing active coding; and eliminating inactive coding. The nature of these changes leads to an estimated PCT impact of 0°F.

- Error in Oxidation Calculations. A closely-related group of errors were discovered in the WCOBRA/TRAC software program. The errors are related to the calculation of high temperature oxidation within a realistic LBLOCA calculation. This issue has been evaluated to estimate the impact on the ASTRUM and the BE LBLOCA licensing basis analysis results. It was determined that correcting the high temperature oxidation calculation in WCOBRA/TRAC is estimated to have a negligible impact on the BE LBLOCA PCT analysis results, leading to an estimated PCT impact of 0°F.
- Error in use of ASME Steam Tables. The American Society of Mechanical Engineers (ASME) steam tables are used to calculate the steady state upper head liquid temperature as a function of the pressure and specific enthalpy in the ASTRUM software program. The steam table applicable to steam/gas is used to determine the upper head fluid temperature. However, the water in the upper head is in the subcooled liquid state during normal operation (and the steady-state calculation). Therefore, the steam table applicable to liquid should be used to determine the upper head fluid temperature. This issue has been evaluated to estimate the impact on ASTRUM BE LBLOCA analysis results. It was determined that the temperatures calculated by the ASME steam tables applicable to the steam/gas side and the liquid side are very similar within the typical upper head pressure and liquid specific enthalpy ranges. Therefore, this error was evaluated to have a negligible impact on 0°F.
- 3. A future plant change, the insertion of up to eight (8) AXIOM[™] lead test assemblies (LTAs) into fuel cycle 19 was evaluated. The AXIOM[™] cladding LTAs at Millstone Unit 3 will be non-limiting with respect to the Millstone Unit 3 LOCA analyses, leading to an estimated PCT impact of 0°F on the LBLOCA and SBLOCA analyses.

North Anna Power Station (North Anna) Units 1 and 2

1. For consistency with the completion of the fuel transition to Westinghouse fuel assemblies and Dominion's plans not to re-insert AREVA fuel assemblies into the North Anna cores, the PCT utilization tables for AREVA Evaluation Models have been deleted as stated in the Virginia Electric and Power Company letter to the NRC dated May 6, 2016 (ADAMS Accession No. ML16134A071) and as indicated below:

North Anna Unit 1 - Small break - AREVA Evaluation Model:	deleted
North Anna Unit 1 - Large break - AREVA Evaluation Model:	deleted
North Anna Unit 2 - Small break - AREVA Evaluation Model:	deleted
North Anna Unit 2 - Large break - AREVA Evaluation Model:	deleted

2. Westinghouse identified no changes or errors applicable to the 1985 Westinghouse SBLOCA Evaluation Model with NOTRUMP for North Anna Units 1 and 2 during 2016.

- 3. A design change (reactor vessel barrel\baffle upflow conversion) was completed for North Anna Unit 2 during the spring 2016 refueling outage. Westinghouse performed an evaluation and concluded the SBLOCA analysis of record performed with the NOTRUMP Evaluation Model continues to remain applicable to North Anna Unit 2 after the implementation of the upflow conversion. Therefore, no changes were made to the SBLOCA rack-up table for North Anna Unit 2 presented in Attachment 3. This information, regarding changes to the North Anna Unit 2 Evaluation Model in 2016, was transmitted to the NRC in the Virginia Electric and Power Company letter to the NRC dated May 6, 2016 (ADAMS Accession No. ML16134A071).
- 4. A design change (reactor vessel barrel\baffle upflow conversion) was completed for North Anna Unit 2 during the spring 2016 refueling outage. Westinghouse performed an evaluation to ensure the LBLOCA model for North Anna Unit 1, which has an upflow baffle/barrel configuration, is representative of Unit 2 subsequent to the upflow conversion. Westinghouse concluded that the LBLOCA analysis results for North Anna Unit 1 are also applicable to North Anna Unit 2. Therefore, the LBLOCA rackup table for North Anna Unit 2 presented in Attachment 3 is updated to reflect this change. This information, regarding changes to the North Anna Unit 2 Evaluation Model in 2016, was transmitted to the NRC in the Virginia Electric and Power Company letter to the NRC dated May 6, 2016 (ADAMS Accession No. ML16134A071).
- 5. Westinghouse identified the following changes or errors applicable to the 2004 Westinghouse BE LBLOCA Evaluation Model using ASTRUM for North Anna Units 1 and 2 during 2016:
 - General Code Maintenance. Various changes have been made to enhance the usability of codes and to streamline future analyses. Examples of these changes include modifying input variable definitions, units and defaults; improving the input diagnostic checks; enhancing the code output; optimizing active coding; and eliminating inactive coding. The nature of these changes leads to an estimated PCT impact of 0°F.
 - Error in Oxidation Calculations. A closely-related group of errors were discovered in the WCOBRA/TRAC software program. The errors are related to the calculation of high temperature oxidation within a realistic LBLOCA calculation. This issue has been evaluated to estimate the impact on the ASTRUM and the BE LBLOCA licensing basis analysis results. It was determined that correcting the high temperature oxidation calculation in WCOBRA/TRAC is estimated to have a negligible impact on the BE LBLOCA peak cladding temperature (PCT) analysis results, leading to an estimated PCT impact of 0°F.

i

- Error in use of ASME Steam Tables. The ASME steam tables are used to calculate the steady state upper head liquid temperature as a function of the pressure and specific enthalpy in the ASTRUM software program. The steam table applicable to steam/gas is used to determine the upper head fluid temperature. However, the water in the upper head is in the subcooled liquid state during normal operation (and the steady-state calculation). Therefore, the steam table applicable to liquid should be used to determine the upper head fluid temperature. This issue has been evaluated to estimate the impact on ASTRUM BE LBLOCA analysis results. It was determined that the temperatures calculated by the ASME steam tables applicable to the steam/gas side and the liquid side are very similar within the typical upper head pressure and liquid specific enthalpy ranges. Therefore, this error was evaluated to have a negligible impact on the ASTRUM BE LBLOCA analysis results, leading to an estimated PCT impact of 0°F.
- Support Column Unheated Conductor Error. A modeling error was discovered in the support column unheated conductor in several BE LBLOCA analyses of record in which the metal thickness of the support columns in the upper plenum was underestimated. The heat transferred to the fluid from the support columns is small relative to the heat release from the core due to high fuel stored energy, decay heat, and since the upper plenum rapidly becomes a steam environment in a LBLOCA. Therefore, it does not significantly contribute to the transient response. The support column unheated conductor modeling error has been generically evaluated to have a negligible impact on the existing analyses, leading to an estimated PCT impact of 0°F.

Surry Power Station (Surry) Units 1 and 2

- 1. Westinghouse identified no changes or errors applicable to the 1985 Westinghouse SBLOCA Evaluation Model with NOTRUMP for Surry Units 1 and 2 during 2016.
- 2. Westinghouse identified the following changes or errors applicable to the 2004 Westinghouse BE LBLOCA Evaluation Model using ASTRUM for Surry Units 1 and 2 during 2016.
 - General Code Maintenance. Various changes have been made to enhance the usability of codes and to streamline future analyses. Examples of these changes include modifying input variable definitions, units and defaults; improving the input diagnostic checks; enhancing the code output; optimizing active coding; and eliminating inactive coding. The nature of these changes leads to an estimated PCT impact of 0°F.
 - Error in Oxidation Calculations. A closely-related group of errors were discovered in the WCOBRA/TRAC software program. The errors are related to the calculation of high temperature oxidation within a realistic LBLOCA

calculation. This issue has been evaluated to estimate the impact on the ASTRUM and the BE LBLOCA licensing basis analysis results. It was determined that correcting the high temperature oxidation calculation in WCOBRA/TRAC is estimated to have a negligible impact on the BE LBLOCA PCT analysis results, leading to an estimated PCT impact of 0°F.

Error in use of ASME Steam Tables. The ASME steam tables are used to calculate the steady state upper head liquid temperature as a function of the pressure and specific enthalpy in the ASTRUM software program. The steam table applicable to steam/gas is used to determine the upper head fluid temperature. However, the water in the upper head is in the subcooled liquid state during normal operation (and the steady-state calculation). Therefore, the steam table applicable to liquid should be used to determine the upper head fluid temperature. This issue has been evaluated to estimate the impact on ASTRUM BE LBLOCA analysis results. It was determined that the temperatures calculated by the ASME steam tables applicable to the steam/gas side and the liquid side are very similar within the typical upper head pressure and liquid specific enthalpy ranges. Therefore, this error was evaluated to have a negligible impact on the ASTRUM BE LBLOCA analysis results, leading to an estimated PCT impact of 0°F.

 Core Barrel Unheated Conductor Errors. Errors were discovered in modeling the core barrel in the vessel lower plenum within the BE LBLOCA analysis of record. An evaluation was performed to estimate the impact on the Surry Units 1 and 2 BE LBLOCA analysis. The modeling errors impacted the thermal resistance and stored energy of the core barrel. A qualitative evaluation concluded that the material modeled for the core barrel unheated conductor is adequate; therefore, this error was evaluated to have a negligible impact on the BE LBLOCA analysis results, leading to an estimated PCT impact of 0°F.

• Discrepancy in Wetted Perimeter Inputs. Inconsistencies were discovered in the wetted perimeter inputs in the upper plenum and upper head of the vessel model for the BE LBLOCA analysis of record. An evaluation was performed to estimate the impact on the Surry Units 1 and 2 BE LBLOCA analysis. A qualitative evaluation of the wetted perimeter at the bottom of the upper head concluded a negligible impact on the BE LBLOCA analysis results, leading to an estimated PCT impact of 0°F.

Conclusion

The LOCA results for Millstone Units 2 and 3, North Anna Units 1 and 2, and Surry Units 1 and 2 are confirmed in the PCT rack-up tables, Attachments 2 through 4, respectively, 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 2016.

Attachment 2

2016 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

2016 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	v Name:	Dominion Nuclear Connecticut, Inc.	
Analy	sis Informatio	<u>n</u> ·	
EM:	2015, Supp. 1,	, SBLOCA, S-RELAP5 Based Limiting Bi	eak Size: 3.78 Inches
Analy	sis Date:	April 2015	
Vendo	or:	AREVA	
Peak I	Linear Power:	15.1 kW/ft	
Notes:	;	None	
			Clad Temp(°F)
LICE	NSING BASIS		
	Analysis of Re	ecord PCT	1707
PCT A	ASSESSMENT Prior ECCS I 1. Zirc-4 Pro	S (Delta PCT) Model Assessments duct Penalty	4 .
B.	Planned Plan 1. None	t Modification Evaluations	0
C.	2016 ECCS N 1. None	Iodel Assessments	0
D.	Other 1. None		. 0
LICE	NSING BASIS	PCT + PCT ASSESSMENTS	PCT = 1711

.

10 CFR 50.46 MARGIN UTILIZATION - LARGE BREAK LOCA

Plant Name:			Millstone Power Station, Unit 2				
Utility	Name:		Dominion Nuclear Connecticut, Inc.				
Analys	sis Info	rmatio	1				
EM:			SEM/PWR-98	Limiting Break Size	e: 1.0 DECLG		
Analys	sis Date	:	11/98	-			
Vendo	r:		AREVA				
Peak I	Linear I	Power:	15.1 kW/ft				
Notes:			None				
					Clad Temp (°F)		
LICEN	NSING	BASIS					
	Analys	is of Re	ecord PCT		1814		
PCT A	SSESS	SMENT	S (Delta PCT)				
А.	Prior I	ECCS	Model Assessments		4		
	I. C	Correcte	d Corrosion Enhancement Fac	tor	-1		
	2. 10		Coding Errors		0		
	3. S	letting F	GIVE Fuel Temperatures at S	start of Reflood	-2		
	4. S	ISPUN	CH/ujun98 Code Error		0		
	5. E	rror in .	Flow Blockage Model in IUC	IDEE2	0		
	0. C	hange i	n TOODEE2-Calculation of C	ZIMAX	0		
	7. C	nange i	n Gadolinia Modeling		0		
	о. г о т	WK LE	Coloulation Error		0		
	9. I 10 I	EUBI	Calculation Error wists Host Transfor in TOODI	200	0		
	10. II 11 E	napprop	Princip Real Transfer In TOOD		0		
	11. E	1925 C	very rite of Junction Inertia		0		
	12. K	hcorrect	Unction Inertia Multipliers		1		
	1 <i>J</i> . 11	rrors D	iscovered During RODEX2 V	\mathcal{R}	1		
	14. E	Fror in	Broken Loon SG Tube Exit Ju	nction Inertia	0		
	16 R	FPAC	Refill and Reflood Calculation	n Code Errors	16		
	10. It	ncorrect	Pump Junction Area Used in	RELAP4	0		
	18. F	Error in '	TOODEE2 Clad Thermal Exp	ansion	-1		
	19. A	Accumu	lator Line Loss Error		-1		
	20. In	nconsis	tent Loss Coefficients Used fo	r Robinson LBLOCA	. 0		
	21. P	ump He	ead Adjustment for Pressure B	alance Initialization	-3		
	22. I	CEĊON	Code Errors		0		
	23. C	Containr	nent Sump Modification and H	Replacement PZR	2		
	24. N	Jon-Cor	nservative RODEX Fuel Pellet	Temperature	20		
	25. A	Array In	dex Issues in the RELAP4 Co	de	0		
D	D 1	1 151					
В.	Planne	ed Plan	t Wodification Evaluations		0		
	1.	None			U		
C.	2016 F	ECCS N	Iodel Assessments				
	1.	None			0		

D. Other

1. None

0

Plant Name: Utility Name:			Aillstone Power S Dominion Nuclear	tation, Unit 3 Connecticut, Inc.	-	
Anal	vsis Info	rmation			<u> </u>	
EM: Analy Vend FQ: Fuel:	ysis Dat lor:	e: 0 V 2 F	JOTRUMP 2/07/07 Vestinghouse 6 RFA-2	Limiting Break FdH: SGTP (%):	Size: 1.65 10	4 inches
Notes	s:	N	Jone			
LICI	E NSING Analy	BASIS sis of Rec	ord PCT		<u>(</u>	Clad Temp (°F) 1193
РСТ	ASSES	SMENTS	(Delta PCT)			
A.	Prior	ECCS M	odel Assessments	S		
	1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	Errors in Calculat: Discrepa Urania-C Pellet Cr Treatmen Maximu Radiatio NOTRU Conduct SBLOC Fuel Roc Radiatio SBLOC Coefficie	Reactor Vessel L ions incy in Metal Mas Fadolinia Pellet T ack and Dish Vol nt of Vessel Avera m Fuel Rod Time n Heat Transfer L MP-EM Evaluation A Cladding Strain I Gap Conductance n Heat Transfer N TA Pre-DNB Clace ent Calculation	Lower Plenum Surface A sses Used From Drawing hermal Conductivity Cal ume Calculation age Temperature Uncerta Step Logic ogic on of Fuel Pellet Therma Requirement for Fuel R ce Error Model Error dding Heat Transfer	rea s culation ainty ll .od Burst	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
B.	Plann 1.	ed Plant I Insertion	Modification Eva 1 of AXIOM [™] Cla	aluations adding LTAs		0
C.	2016] 1.	ECCS Mo None	del Assessments			0
D.	Other 1	None				0
	ENSING	BASIS F	PCT + PCT ASSI	ESSMENTS	PCT =	1193

10 CFR 50.46 MARGIN UTILIZATION - SMALL BREAK LOCA

Plant Nam	e: Millstone l	Power Station.	Unit 3			
Utility Nar	ne: Dominion	Dominion Nuclear Connecticut, Inc.				
Analysis In	formation					
EM:	ASTRUM	(2004)	Limiting Brea	ık Size:	Guillotine	
Analysis D	ate: 04/17/07		8			
Vendor:	Westingho	use				
FQ:	2.6		FdH:	1.65		
Fuel:	RFA-2		SGTP (%):	10		
Notes:	None					
					Clad Temp (°F)	
LICENSIN	G BASIS					
Ana	lysis of Record PCT				1781	
PCT ASSE	SSMENTS (Delta P	CT)				
A. Prie	or ECCS Model Asse	ssments			_	
1.	HOTSPOT Burst	Temperature L	ogic Errors		0	
2.	CCFL Global Vol	ume Error			0	
3.	HOTSPOT Gap H	leat Transfer L	ogic		0	
4.	Discrepancy in M	etal Masses Us	sed From Drawi	ngs	0	
5. Error in ASTRUM Processing of Average Rod Burnup 0					0	
<i>r</i>	and Rod Internal I	ressure	4 T T	, • ,	0	
6. 7	Treatment of Vessel Average Temperature Uncertainty				0	
7.	PBOT and PMID Evaluation			0		
δ.	8. Evaluation of Fuel Pellet Thermal Conductivity					
0	Degradation	Tommorotumo (algulation		0	
9.	for 7IDL O Cladd	remperature C	alculation		U	
10	Pod Internal Press	ng ura Calculatio	n		0	
10.	HOTSPOT Iterati	on Algorithm	for Calculating t	he	0	
11.	Initial Fuel Pellet	Average Tem	nerature		v	
12.	WCOBRA/TRAC	Thermal-Hvd	raulic History F	ile	0	
121	Dimension used in	1 HSDRIVER	Background		-	
13.	WCOBRA/TRAC	Automated R	estart Process L	ogic Error	` 0	
14.	Initial Fuel Pellet	Average Temp	perature Uncerta	inty	0	
	Calculation	C 1				
15.	Elevations for Hea	at Slab Temper	rature Initializat	ion	0	
16.	Heat Transfer Mo	del Error Corr	ections		0	
17.	Correction to Hea	t Transfer Nod	le Initialization		0	
18.	Mass Conservatio	n Error Fix			0	
19.	Correction to Spli	t Channel Mor	nentum Equatio	n	0	
20.	Heat Transfer Log	gic Correction	for Rod Burst C	alculation	0	
21.	Changes to Vesse	Superheated	Steam Propertie	S	0	
22.	Update to Metal I	Density Referen	nce Temperatur	es	0	
23.	Decay Heat Mode	l Error Correc	tions	·	0	
24.	Correction to the l	Pipe Exit Press	sure Drop Error		0	

10 CFR 50.46 MARGIN UTILIZATION - LARGE BREAK LOCA

	25.	WCOBRA/TRAC U19 File Dimension Error Correction	0
	26.	Revised Heat Transfer Multiplier Distributions	-91
	27.	HOTSPOT Burst Strain Error Correction	21
	28.	Changes to Grid Blockage Ratio and Porosity	0
	29.	Grid Heat Transfer Enhancement Calculation	0
	30.	Burst Elevation Selection	0
	31.	Errors in Decay Group Uncertainty Factors	0
	32.	Errors in Support Plate, Core Barrel, and Vessel Wall	0
		Unheated Conductor	
B.	Plann 1.	ed Plant Modification Evaluations Insertion of AXIOM [™] Cladding LTAs	0
C.	2016 H	ECCS Model Assessments	
	1.	Error in Oxidation Calculations	0
	2.	Error in use of ASME Steam Tables	0
D.	Other		
	1.	None	0

LICENSING BASIS PCT + PCT ASSESSMENTS PCT = 1933

Attachment 3

2016 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

2016 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION

1

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

1834.1

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE SMALL BREAK LOCA

Plant N Utility	Plant Name:North Anna Power Station, Unit 1Utility Name:Virginia Electric and Power Company							
Analysis Informatio EM: Analysis Date: Vendor:			<u>1</u> NOTRUM 12/20/2010 Westingho	P) use	Limiting Break Size:		2.75 inches	
FQ:			2.32 DEA 2	I	$F\Delta H$:		1.65	
ruei: Notes:			RFA-2 None		SGIP (%):			
LICEN	NSING Analys	BASIS sis of Re	ecord PCT					<u>Clad Temp (°F)</u> 1834.1
PCT A A.	SSESS Prior I 1. 2. 3. 4. 5.	SMENT ECCS M NOTR Conduc SBLOO Fuel R Radiati SBLOO Coeffic	S (Delta Polo Model Asse UMP-EM H ctivity Degr CTA Cladd od Gap Cor ion Heat Tr CTA Pre-D cient Calcul	CT) ssments Evaluation of I adation ing Strain Rec aductance Erro ansfer Model NB Cladding ation	Fuel Pellet Th Juirement for J or Error Heat Transfer	ermal Fuel F	Rod Bu	0 urst 0 0 0 0
В.	Planne 1.	ed Plan None	t Modifica	tion Evaluatio	ons			0
C.	2016 E 1.	ECCS M None	Iodel Asses	ssments				0
D.	Other 1.	None						0

LICENSING BASIS PCT + PCT ASSESSMENTS PCT =

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE LARGE BREAK LOCA

Plan	t Name:	North Anna Power Station, Unit 1			
Utili	ty Name				
Anal	lysis Inf	ormation		· · · · · · · · · · · · · · · · · · ·	
EM:		ASTRUM (2004) Limiting Brea	k Size:	DEGB	
Anal	lysis Dat	te: 8/25/2010			
Vend	dor:	Westinghouse			
FQ:		2.32 FΔH :	1.65		
Fuel	:	RFA-2 SGTP (%) :	7		
Note	s:	Core Power ≤ 100% of 2951 MWt; SG Model 54F; 17x ZIRLO™ cladding, Non-IFBA or IFBA, IFMs	17 RFA-2 F	uel with ZIRLO® or Optimized	
	DIGINI			<u>Clad Temp (°F)</u>	
LICI		BASIS		1050	
	Analy	is of Record PC1		1852	
РСТ	ASSES	SMENTS (Delta PCT)			
A.	Prior	ECCS Model Assessments			
	1.	Evaluation of Fuel Pellet Thermal Conductivity		135	
		Degradation			
	2.	HOTSPOT Burst Temperature Calculation		0	
		for ZIRLO Cladding			
	3.	Rod Internal Pressure Calculation		· 0	
	4.	HOTSPOT Iteration Algorithm for Calculating the	ne	0	
		Initial Fuel Pellet Average Temperature			
	5.	WCOBRA/TRAC Thermal-Hydraulic History Fi	le	0	
		Dimension used in HSDRIVER Background			
	6.	WCOBRA/TRAC Automated Restart Process Lo	gic Error	0	
	7.	Initial Fuel Pellet Average Temperature Uncertai	Fuel Pellet Average Temperature Uncertainty		
		Calculation			
	8.	Elevations for Heat Slab Temperature Initialization	on	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	L	0	
	13.	Heat Transfer Logic Correction for Rod Burst Ca	lculation	0	
	14.	Changes to Vessel Superheated Steam Properties		0	
	15.	Update to Metal Density Reference Temperature	5	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 Co	rrection	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	

Serial No. 17-264 Docket Nos. 50-338/339 10 CFR 50.46 Annual Report Attachment 3 23. Vessel Section 7 Mid-Level Elevation Modeling 0 **Burst Elevation Selection** 24. 0 Errors in Decay Group Uncertainty Factors 25. 0 **B. Planned Plant Modification Evaluations** None 0 1. **C**. **2016 ECCS Model Assessments** Error in Oxidation Calculations 1. 0 2. Error in use of ASME Steam Tables 0 3. Support Column Core Barrel Unheated Conductor Errors 0 D. Other **Transition Core** 1. 0 LICENSING BASIS PCT + PCT ASSESSMENTS 1982 PCT =

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE SMALL BREAK LOCA

Plant	Plant Name: North Anna Power Station, Unit 2						
Utility	y Name:	Virginia Electri	c and Power Company				
Analy	sis Info	rmation					
EM:		NOTRUMP	Limiting Break	Size:	2.75 inches		
Analy	sis Date	: 12/20/2010					
Vend	or:	Westinghouse					
FQ:		2.32	FΔH:	1.65			
Fuel:		RFA-2	SGTP (%):	7			
Notes	:	None					
					Clad Temp (°F)		
LICE	NSING	BASIS					
	Analys	sis of Record PCT			1834.1		
РСТ	ASSESS	MENTS Melta PCT)					
Δ	Prior	ECCS Model Assessme	nts				
7 20	1	NOTRUMP-EM Evalu	ation of Fuel Pellet Therma	1	0		
		Conductivity Degradati	ion		Ū		
	2.	SBLOCTA Cladding S	train Requirement for Fuel	Rod Bu	urst 0		
	3.	Fuel Rod Gap Conduct	ance Error	100 200	0		
	4.	Radiation Heat Transfe	r Model Error		0		
	5.	SBLOCTA Pre-DNB C	Cladding Heat Transfer		0		
		Coefficient Calculation					
B	Plann	ed Plant Modification I	Evaluations				
	1.	None			0		
C	2 017 T	CCS Madel Assessment	- 40				
C.	2010 F	None	ats		٥		
	1.	None			0		
D.	Other						
	1.	None			0		
LICE	NSING	BASIS PCT + PCT AS	SSESSMENTS	<u>PCT =</u>	= 1834.1		

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE LARGE BREAK LOCA

Plant	Name:	North Anna Power Station, Unit 2	North Anna Power Station, Unit 2				
	<u>y Name</u>	virginia Electric and Power Company					
Analy	vsis Info	prmation	DECD				
ENI:	unia Dad	$ASTRUM (2004) \qquad Limiting Break Size:$	DEGB				
Anar	ysis Dat	e: 8/25/2010 Westinghouse					
vепа БО	or:	westingnouse					
rų: Fusli		2.32 FAH: 1.05					
Fuel:		KFA-2 SGIP (%): /					
notes		ZIRLO [™] cladding, Non-IFBA or IFBA, IFMs	uel with ZIRLO® or Optimized				
			<u>Clad Temp (°F)</u>				
LICE	ENSING	BASIS	1050				
	Analy	sis of Record PCT	1852				
РСТ	ASSES	SMENTS (Delta PCT)					
A.	Prior	ECCS Model Assessments					
	1.	Evaluation of Fuel Pellet Thermal Conductivity	135				
		Degradation					
	2.	HOTSPOT Burst Temperature Calculation	0				
		for ZIRLO Cladding					
	3.	Rod Internal Pressure Calculation	0				
	4.	HOTSPOT Iteration Algorithm for Calculating the	0				
	_	Initial Fuel Pellet Average Temperature					
	5.	WCOBRA/TRAC Thermal-Hydraulic History File	0				
	<i>(</i>	Dimension used in HSDRIVER Background	•				
	6. 7	WCOBRA/IRAC Automated Restart Process Logic Error	0				
	7.	Initial Fuel Pellet Average Temperature Uncertainty	l .				
	0	Calculation	٥				
	<u>8</u> .	Lievations for Heat Slab Temperature Initialization	0				
	9. 10	Correction to Heat Transfer Mode Initialization	0				
	10.	Mass Conservation Error Fix	0				
	12	Correction to Split Channel Momentum Equation	0				
	12.	Heat Transfer Logic Correction for Rod Burst Calculation	0				
	13.	Changes to Vessel Superheated Steam Properties	ů ·				
	15	Undate to Metal Density Reference Temperatures	ů 0				
	16	Decay Heat Model Error Corrections	Ő				
	17	Correction to the Pipe Exit Pressure Drop Error	ů				
	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				

LIC	ENSIN	G BASIS PCT + PCT ASSESSMENTS PCT =	1982	
	1.	Transition Core	0	
D.	Othe	er (
	3.	Support Column Core Barrel Unheated Conductor Errors	0	
	2.	Error in use of ASME Steam Tables	0	
	1.	Error in Oxidation Calculations	0	
C.	2016	ECCS Model Assessments		
	1.	None	0	
В.	Plan	ned Plant Modification Evaluations		
	25.	Errors in Decay Group Uncertainty Factors	0	
	24.	Burst Elevation Selection	0	
	23.	Vessel Section 7 Mid-Level Elevation Modeling	0	
	22.	Grid Heat Transfer Enhancement Calculation	0	

Attachment 4

2016 ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM (ECCS) MODEL CHANGES PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.46

2016 ANNUAL REPORTING OF 10 CFR 50.46 MARGIN UTILIZATION

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

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE SMALL BREAK LOCA

Plant Name:		Surr	y Power Station	n, Unit 1		
Utility Name:		Virg	inia Electric an	d Power Company		
Analy	sis Info	rmation				
EM:		NO	ΓRUMP	Limiting Brea	k Size:	2.75 inches
Analy	sis Date	: 5/7/	2009			
Vendo	or:	Wes	stinghouse			
FQ:		2.5		FΔH:	1.7	
Fuel:		Upg	rade	SGTP (%):	7	
Notes:	1	Non	e			
						Clad Temp (°F)
LICE	NSING	BASIS				•
	Analys	is of Record	PCT			2012
PCT A	ASSESS	MENTS (D	elta PCT)			
A.	Prior I	ECCS Mode	el Assessments			
	1.	Urania-Gad	olinia Pellet Th	ermal Conductivity C	alculation	. 0
	2.	Pellet Crack	c and Dish Volu	me Calculation.		0
	3.	Treatment of	of Vessel Avera	ge Temperature Unce	rtainty	0
	4.	15X15 Upg	rade Fuel			0
	 Maximum Fuel Rod Time Step Logic Radiation Heat Transfer Logic 			0		
				0		
7. NOTR		NOTRUMI	UMP-EM Evaluation of Fuel Pellet Thermal			0
	_	Conductivit	y Degradation			
	8.	SBLOCTA	CTA Cladding Strain Requirement for Fuel Rod Burst			cst 0
	9.	Fuel Rod G	ap Conductance	e Error		0
	10.	Radiation H	leat Transfer M	odel Error		0
	11.	SBLOCIA	Pre-DNB Clade	ding Heat Transfer		0
		Coefficient	Calculation			
B.	Planne	ed Plant Mo	dification Eval	luations		
	1.	None				0
C. 2016 ECCS Model Assessments						
	1.	None				0
D. Other						
	1.	None				0
LICE	NSING	BASIS PC	Γ + PCT ASSE	SSMENTS	PCT =	2012

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE LARGE BREAK LOCA

		· · · · · · ·	· · · · · · · · · · · · · · · · · · ·						
Plant Name: Utility Name:		Surry Power Station, Unit	Surry Power Station, Unit 1						
		Virginia Electric and Pow	Virginia Electric and Power Company						
Analy	<u>sis Info</u>	rmation							
EM:		ASTRUM (2004)	Limiting Break S	ize:	DEG				
Analysis Date:		e: 10/6/2010							
Vendo	or:	Westinghouse							
FQ:		2.5	F∆H:	1.7		١			
Fuel:		Upgrade	SGTP (%):	7					
Notes:	:	None							
			1		<u>Clad Temp (°F)</u>				
LICE	NSING	BASIS							
	Analy	sis of Record PCT			1853				
PCT /	ACCEC	MENTS Malta PCT)							
A.	Prior	ECCS Model Assessments							
	1.	Evaluation of Fuel Pellet Therma	l Conductivity		183				
		Degradation	•						
	2.	Pellet Radial Profile Option			-13				
	3.	HOTSPOT Burst Temperature C	alculation		, O				
		for ZIRLO Cladding							
	4.	Rod Internal Pressure Calculation	n		0				
	5.	HOTSPOT Iteration Algorithm f	or Calculating the		0				
		Initial Fuel Pellet Average Temp	berature						
	6.	WCOBRA/TRAC Thermal-Hydr	raulic History File		0				
	_	Dimension used in HSDRIVER	Background	-	0				
	7.	WCOBRA/TRAC Automated Re	estart Process Logic	Error	0				
	8.	Initial Fuel Pellet Average Temp	erature Uncertainty	•	0				
	0	Calculation	- 4 T 4! - 1! 4!		0				
	9. 10	Elevations for Heat Slab Temper	ature initialization		0				
	10.	Germantian to Heat Transfer Model	cuons		0				
	11.	Mass Conservation Error Fiv			0				
	12.	Correction to Split Channel Mon	pentum Equation		0				
	12.	Heat Transfer I ogic Correction f	for Rod Burst Calcu	lation	0				
	15	Changes to Vessel Superheated S	Steam Properties	nanon	ů 0				
	16	Undate to Metal Density Referen	ce Temperatures		Ő				
	17	Decay Heat Model Error Correct	ions		Ő				
	18.	Correction to the Pipe Exit Press	ure Drop Error		0				
	19.	WCOBRA/TRAC U19 File Dim	ension Error Correc	ction	0				
	20.	Revised Heat Transfer Multiplier	Distributions		-7				
	21.	HOTSPOT Burst Strain Error Co	orrection		51				
	22.	Changes to Grid Blockage Ratio	and Porosity		0				
	23.	Grid Heat Transfer Enhancement	t Calculation		0				

ī.

	;	Serial No. 17-264 Docket Nos. 50-280/281 10 CFR 50.46 Annual Report Attachment 4
24.	Vessel Section 7 Mid-Level Elevation Modeling	0
25.	Burst Elevation Selection	0
26.	Errors in Decay Group Uncertainty Factors	4
Plan	ned Plant Modification Evaluations	
1. ·	Evaluation of Additional Containment Metal	0
2016	ECCS Model Assessments	
1.	Error in Oxidation Calculations	0
2.	Error in use of ASME Steam Tables	0
3.	Core Barrel Unheated Conductor Errors	0
4.	Discrepancy in Wetted Perimeter Inputs	. 0
Othe	r	
1.	None	0

B.

C.

D.

1.

PCT = LICENSING BASIS PCT + PCT ASSESSMENTS 2071

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE SMALL BREAK LOCA

Plant Name: Utility Name:		Surry Po Virginia	ver Station, U	nit 2 ower Company			
Analy	vsis Info	mation		ower company			
EM: Analy Vende FQ: Fuel:	vsis Date or:	NOTRUI : 5/7/2009 Westingh 2.5 Upgrade	dP ouse	Limiting Bre F∆H: SGTP (%):	ak Size: 1.7 7	2.75 inches	
THORES	•	INOILE				Clad Temp (°F)	
LICE	NSING	BASIS					
LICE	Analys	is of Record PCT				2012	
PCT	ASSESS	MENTS (Delta)	PCT)				
A.	Prior 1	ECCS Model As	sessments				
	1.	Urania-Gadolini	a Pellet Therm	nal Conductivity	Calculation	n 0	
	2.	Pellet Crack and	Dish Volume	Calculation		0	
	3.	Treatment of Ve	ssel Average	0			
	4.	15X15 Upgrade	Fuel	0			
	5.	Maximum Fuel	Rod Time Step	0			
	6.	Radiation Heat 7	ransfer Logic			0	
	7.	NOTRUMP-EM	DTRUMP-EM Evaluation of Fuel Pellet Thermal				
	8	SBI OCTA Clad	OCTA Cladding Strain Dequirement for Fuel Pod Burst				
	о. О	Fuel Rod Gan C	ung Suam Ko onductance Fr	ror		0	
). 10	Radiation Heat]	ransfer Mode	l Error		0	
	10.	SBI OCTA Pre-	NR Cladding	n Heat Transfer		0	
	11.	Coefficient Calc	ulation	5 mout manufici			
В.	Plann	ed Plant Modific	ation Evalua	tions			
	1.	None				0	
C. 2016 ECCS Model Assessments							
	1.	None				0	
D.	Other 1.	None				0	
	NSING	BASIS PCT + P	CT ASSESSI	MENTS	PCT =	= 2012	

10 CFR 50.46 MARGIN UTILIZATION - WESTINGHOUSE LARGE BREAK LOCA

					_				
Plant Name: Utility Name:		Surry Power Station, Unit 2	Surry Power Station, Unit 2						
		: Virginia Electric and Power Company	Virginia Electric and Power Company						
Analy	ysis Info	ormation							
EM:		ASTRUM (2004) Limiting Br	eak Size:	DEG					
Analysis Date:		e: 10/6/2010	10/6/2010						
Vend	or:	Westinghouse							
FQ:		2.5 F Δ H :	1.7						
Fuel:		Upgrade SGTP (%):	7						
Notes	:	None			_				
				<u>Clad Temp (°F)</u>					
LICE	INSING	BASIS							
	Analy	sis of Record PCT		1853					
DOT	ACCEC								
PCT.	ASSES	SMENIS (Delta PCI) ECCS Model Assessments							
А.	Prior	ECCS Model Assessments							
	1	Evaluation of Fuel Pellet Thermal Conductivit	V	183					
	1.	Degradation	9	105					
	2	Pellet Radial Profile Ontion		-13					
	3	HOTSPOT Burst Temperature Calculation		0					
	51	for ZIRLO Cladding		J.					
	4.	Rod Internal Pressure Calculation		0					
	5.	HOTSPOT Iteration Algorithm for Calculating	g the	0					
		Initial Fuel Pellet Average Temperature	5						
	6.	WCOBRA/TRAC Thermal-Hydraulic History	File	0					
		Dimension used in HSDRIVER Background							
	7.	WCOBRA/TRAC Automated Restart Process	Logic Error	0					
	8.	Initial Fuel Pellet Average Temperature Uncer	tainty	0					
		Calculation							
	9.	Elevations for Heat Slab Temperature Initialization	ation	0	•				
	10.	Heat Transfer Model Error Corrections		0					
	11.	Correction to Heat Transfer Node Initialization	ı	0					
	12.	Mass Conservation Error Fix	_	0					
	13.	Correction to Split Channel Momentum Equation	ion	0					
	14.	Heat Transfer Logic Correction for Rod Burst	Calculation	0					
	15.	Changes to Vessel Superheated Steam Property	ies	0					
	16.	Update to Metal Density Reference Temperatu	ires	0					
	17.	Decay Heat Model Error Corrections		0					
	18.	Correction to the Pipe Exit Pressure Drop Erro	or a i	0					
	19.	WCOBRA/TRAC U19 File Dimension Error (Correction	0					
	20.	Revised Heat Transfer Multiplier Distributions	5	-7					
	21.	HOTSPOT Burst Strain Error Correction		51					
	22.	Changes to Grid Blockage Ratio and Porosity		0					
	23.	Grid Heat Transfer Enhancement Calculation		U					

.

LICENSING BASIS PCT + PCT ASSESSMENTS			PCT =	2071	
D.	Othe 1.	er None		0	
	4. Di	screpancy in Wetted Perimeter Inputs		0	
	3. Co	ore Barrel Unheated Conductor Errors		0	
	2. Er	ror in use of ASME Steam Tables		0	
U.	1. Er	ror in Oxidation Calculations		0	
C	2016	ECCS Model Assessments			
	1.	Evaluation of Additional Containment Metal		0	
b.	Plan	ned Plant Modification Evaluations			
	26.	Errors in Decay Group Uncertainty Factors		4	
	25.	Burst Elevation Selection		0	
	24.	Vessel Section 7 Mid-Level Elevation Modeling	5	0	