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10 CFR 50.46

W3F1-2018-0029

June 7, 2018

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Annual Report on Westinghouse Electric Company LLC Combustion Engineering Emergency Core Cooling System Performance Evaluation Models for Calendar Year 2017
Waterford Steam Electric Station Unit 3
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

This letter provides the Waterford Steam Electric Station Unit 3 (Waterford 3) 10 CFR 50.46(a)(3)(ii) reporting information pertaining to the Westinghouse Electric Company Emergency Core Cooling System (ECCS) performance Evaluation Models (EMs) for calendar year 2017.

There were no changes, error corrections, or enhancements to the 1999 Evaluation Model (EM) which is used in the Large Break Loss-of-Coolant Accident (LBLOCA) Emergency Core Cooling Systems (ECCS) performance analysis. In addition, there were no changes, error corrections, or enhancements to the Supplement 2 Evaluation Model (S2M) which is the EM used in the Small Break Loss-of-Coolant Accident (SBLOCA) ECCS performance analysis.

This letter contains no new commitments.

If you have any questions, or require additional information, please contact John Jarrell at 504-739-6685.

Sincerely,

JPJ/LLB

Attachment: Waterford Steam Electric Station Unit 3 10 CFR 50.46 Annual Notification and Reporting for 2017

cc: Mr. Kriss Kennedy,
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NRC Project Manager for Waterford 3
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Attachment to

W3F1-2018-0029

Waterford Steam Electric Station Unit 3

10 CFR 50.46 Annual Notification and Reporting for 2017

Waterford Steam Electric Station Unit 3
10 CFR 50.46 Annual Notification and Reporting for 2017

There were no changes, error corrections, or enhancements to the 1999 Evaluation Model (EM), which is the EM used in Waterford 3 Large Break Loss-of-Coolant Accident (LBLOCA) Emergency Core Cooling System (ECCS) performance analysis in calendar year 2017. In addition, there were no changes, error corrections or enhancements to the Supplement 2 Evaluation Model (S2M), which is the EM used in Waterford 3 Small Break Loss-of-Coolant Accident (SBLOCA) ECCS performance analysis in calendar year 2017.

The limiting PCT results for the large and small break LOCAs continue to meet the criteria of 10 CFR 50.46, paragraph (b) for calendar year 2017.

A summary of the information related to peak clad temperatures (PCT) and adjustment to peak clad temperatures is provided in the following table:

Summary of Information for Waterford 3 10 CFR 50.46 Annual Report for 2017

	Analysis of Record (AOR) Peak Cladding Temperature (PCT), ^{o}F Evaluation Model (EM) Used AOR Date	Adjustment as of End-of-Year (EOY) 2017, (^{o}F)	Net PCT at the EOY 2017, (^{o}F)
Small-Break Loss-of-Coolant Accident (SBLOCA)	1925 S2M 6/19/2009	-27	1898
Large-Break Loss-of-Coolant Accident (LBLOCA)	2092 1999EM 7/16/2009	-3	2089

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Our ref: LTR-SATH-18-005, Rev.0
May 10, 2018

Waterford Nuclear Generating Station Unit 3
10 CFR 50.46 Annual Notification and Reporting for 2017

Dear Sir or Madam:

This letter provides 10 CFR 50.46 reporting information pertaining to the Westinghouse Electric Company emergency core cooling system (ECCS) performance evaluation models (EMs) and their application to the Waterford Nuclear Generating Station Unit 3 (Waterford 3) for calendar year 2017.

There were no changes, error corrections, or enhancements to the 1999 EM, which is the EM used in the Waterford 3 large break loss of coolant accident (LBLOCA) ECCS performance analysis in calendar year 2017. Additionally, there were no 2017 changes, error corrections, or enhancements to the Supplement 2 evaluation model (S2M), which is the EM used in the Waterford 3 small break loss of coolant accident (SBLOCA) ECCS performance analysis.

The peak cladding temperature (PCT) rackup sheets, along with Waterford 3 specific evaluation text, are enclosed in the attachments. The rackup sheets identify the PCTs of the ECCS performance analyses of record (AOR) for Waterford 3 and the PCT assessments associated with the AOR through the end of calendar year 2017.

This letter is provided for your use in making a determination relative to the reporting requirements of 10 CFR 50.46. The information provided in this letter was prepared in accordance with the Westinghouse Global Management System (WGMS).

Author: (Electronically Approved)*
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Setpoints & Advanced Thermal Hydraulics

Verifier: (Electronically Approved)*
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Manager, Setpoints & Advanced Thermal Hydraulics

Electronically approved records are authenticated in the electronic document management system.

RACKUP SharePoint Check:

EMs applicable to Waterford Nuclear Generating Station Unit 3:
Appendix K Small Break – S2M
Appendix K Large Break – 1999 EM

2017 Issues

Transmittal Letter	Issue Description
None	N/A

Attachment 1: 10 CFR 50.46 Reporting Text

WATERFORD 3 CYCLE 22 RELOAD ECCS PERFORMANCE ASSESSMENT
(Non-Discretionary Change)

Background

The LBLOCA ECCS Performance analyses for Cycle 22 was performed by assessing the Waterford 3 ECCS Performance Analysis Comprehensive Checklist (CCL) as documented in Reference 1 using the design analysis in Reference 2. This analysis was designed to be bounding for transition core configurations as well as future full core configurations of NGF assemblies and inclusion of the RSGs. In addition, Cycle 22 specific analyses were performed in Reference 3 to assess CCL parameters that could not be confirmed to be bounding by inspection. Successfully assessing the CCL confirmed that the results from the Waterford 3 bounding analyses for RSGs with NGF remain applicable to Waterford 3 Cycle 22.

For Waterford 3 Cycle 22, all CCL parameters listed in Table 6.3.1-1 therein were successfully assessed. This outcome confirms that the results from the Waterford 3 LBLOCA bounding analysis (Reference 2) for RSG implementation with a full core of NGF remain applicable to Waterford 3 Cycle 22. During the checklist confirmation analysis, physics assessment checklist (PAC) exceptions applicable to LBLOCA analysis were identified for the Cycle 22 specific core design. The PAC exceptions were the core pin census for core-wide oxidation analysis (CCL Item No. 29) and the minimum hot rod pin-to-box factor (CCL Item No. 30). Reference 3 documents analyses that were performed to disposition these PAC exceptions.

Reference 3 documents analyses using the Cycle 22 values for CCL Items 29 and 30 identified in the PAC exceptions together with Cycle 22 specific core physics data for the maximum integrated radial peaking factor and minimum X-factor for rod-to-rod radiation heat transfer. The analyses show a reduction in the PCT for the limiting LBLOCA of 2.7 °F (as well as a reduction in the CWO of 0.001%) and concludes that the Cycle 22 PCT is bounded by the LBLOCA bounding analyses in Reference 2.

Affected Evaluation Models(s)

1999 EM Large Break Evaluation Model

Estimated Effect

The impact of the Cycle 22 core pin census for core-wide oxidation analysis and the minimum hot rod pin-to-box factor together with other Cycle 22 specific core physics data is a reduction in the PCT of 2.7 °F and no impact on SBLOCA.

Reference(s)

1. CN-OA-02-54, Revision 13, "ECCS Performance Analysis Comprehensive Checklist for Waterford 3," January 31, 2017.
2. CN-OA-08-67, Rev. 0, "Waterford 3 LBLOCA ECCS Performance Analysis with Replacement Steam Generators," E.F. Jageler, July 16, 2009 (including CN-OA-08-67-R0-ASMT-1).
3. CN-TLA-16-005, Revision 0, "Waterford 3 Cycle 22 ECCS Performance Reload Assessment," January 31, 2017.

Attachment 2: LBLOCA and SBLOCA Rackup Sheets

Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Large Break

Cycle 21

Plant Name: Waterford 3
Utility Name: Entergy Nuclear - South
Revision Date: 3/24/2017

Analysis Information

EM:	1999 EM	**Analysis Date:**	7/16/2009	**Limiting Break Size:**	1.0 DEG/PD
Fuel:	CE 16x16 NGF	**SGTP (%):**	10		
		PLHGR	12.9		

Notes: 1. Plant Configuration: Rated Core Power = 3716 MWt, Replacement Steam Generators.
2. Fuel Design: CE 16×16 NGF with Optimized ZIRLO™ cladding and ZrB2 burnable absorbers.

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	**2092**	1, 2	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1. None	0		
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1. None	0		
C. ECCS MODEL ASSESSMENTS			
1. None	0		
D. OTHER*			
1 . Cycle 21 core physics parameter modeling	0	3	
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 2092		

* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

References

1. LTR-WEN-RSG-11-013, R. F. Lion, III (Westinghouse) to L. Rushing (Entergy Operations Inc.), "Transmittal of LTR-TDA-10-65, Rev. 0 Waterford 3 Replacement Steam Generators Project," February 2011.
2. W3F1-2014-0024, "10 CFR 50.46 Significant Change Report for the Waterford 3 Emergency Core Cooling System Performance Analysis Due to Implementation of the Replacement Steam Generators," March 2014 (NRC Adams ML14085A465).
3. Westinghouse Letter, NF-WTFD-15-24, Revision 2, Amy L. Miller (Westinghouse) to C.G. Eastus (Entergy Operations, Inc.), "ENTERGY NUCLEAR SOUTH Waterford-3 Cycle 21 Final Reload Analysis Report, Revision 2," November 2, 2015.

Notes:

None

Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Large Break

Cycle 22

Plant Name: Waterford 3
Utility Name: Entergy Nuclear - South
Revision Date: 4/5/2018

Analysis Information

EM:	1999 EM	**Analysis Date:**	7/16/2009	**Limiting Break Size:**	1.0 DEG/PD
Fuel:	CE 16x16 NGF	**SGTP (%):**	10		
		PLHGR	12.9		

Notes: 1. Plant Configuration: Rated Core Power = 3716 MWt, Replacement Steam Generators.
2. Fuel Design: CE 16×16 NGF with Optimized ZIRLO™ cladding and ZrB2 burnable absorbers.

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	**2092**	1, 2	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1. None	0		
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1. None	0		
C. ECCS MODEL ASSESSMENTS			
1. None	0		
D. OTHER*			
1 . Cycle 22 core physics parameter modeling	−3	3	
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 2089		

* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

References

1. LTR-WEN-RSG-11-013, R. F. Lion, III (Westinghouse) to L. Rushing (Entergy Operations Inc.), "Transmittal of LTR-TDA-10-65, Rev. 0 Waterford 3 Replacement Steam Generators Project," February 2011.
2. W3F1-2014-0024, "10 CFR 50.46 Significant Change Report for the Waterford 3 Emergency Core Cooling System Performance Analysis Due to Implementation of the Replacement Steam Generators," March 2014 (NRC Adams ML14085A465).
3. Westinghouse Letter, NF-WTFD-17-6, Revision 1, Andrew Sheaffer (Westinghouse) to C.G. Eastus (Entergy Operations, Inc.), "ENTERGY NUCLEAR SOUTH Waterford-3 Cycle 22 Final Reload Analysis Report, Revision 1," April 27, 2017.

Notes:

None

Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Small Break

Cycle 21

Plant Name: Waterford 3
Utility Name: Entergy Nuclear - South
Revision Date: 3/24/2017

Analysis Information

EM:	S2M	**Analysis Date:**	6/19/2009	**Limiting Break Size:**	0.05 ft2/PD
Fuel:	CE 16x16 NGF	**SGTP (%):**	10		
		PLHGR	13.2		

Notes: 1. Plant Configuration: Rated Core Power = 3716 MWt, Replacement Steam Generators.
2. Fuel Design: CE 16x16 NGF with Optimized ZIRLO™ cladding and ZrB2 burnable absorbers.

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	**1925**	**1,3**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . Change in HPSI flow rate versus RCS pressure	-27	2	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . Cycle 21 core physics parameter modeling	0	2	
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1898		

* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

References

1. LTR-WEN-RSG-11-013, R. F. Lion, III (Westinghouse) to L. Rushing (Entergy Operations Inc.), "Transmittal of LTR-TDA-10-65, Rev. 0 Waterford 3 Replacement Steam Generators Project," February 2011.
2. Westinghouse Letter, NF-WTFD-15-24, Revision 2, Amy L. Miller (Westinghouse) to C.G. Eastus (Entergy Operations, Inc.), “ENTERGY NUCLEAR SOUTH Waterford-3 Cycle 21 Final Reload Analysis Report, Revision 2,” November 2, 2015.
3. W3F1-2014-0024, "10 CFR 50.46 Significant Change Report for the Waterford 3 Emergency Core Cooling System Performance Analysis Due to Implementation of the Replacement Steam Generators," March 2014.

Notes:

None

Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Small Break

Cycle 22

Plant Name: Waterford 3
Utility Name: Entergy Nuclear - South
Revision Date: 4/5/2018

Analysis Information

EM:	S2M	**Analysis Date:**	6/19/2009	**Limiting Break Size:**	0.05 ft2/PD
Fuel:	CE 16x16 NGF	**SGTP (%):**	10		
		PLHGR	13.2		

Notes: 1. Plant Configuration: Rated Core Power = 3716 MWt, Replacement Steam Generators.
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A. PRIOR ECCS MODEL ASSESSMENTS			
1 . Change in HPSI flow rate versus RCS pressure	-27	2	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . Cycle 22 core physics parameter modeling	0	2	
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1898		

* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

References

1. LTR-WEN-RSG-11-013, R. F. Lion, III (Westinghouse) to L. Rushing (Entergy Operations Inc.), "Transmittal of LTR-TDA-10-65, Rev. 0 Waterford 3 Replacement Steam Generators Project," February 2011.
2. Westinghouse Letter, NF-WTFD-17-6, Revision 1, Andrew Sheaffer (Westinghouse) to C.G. Eastus (Entergy Operations, Inc.), "ENTERGY NUCLEAR SOUTH Waterford-3 Cycle 22 Final Reload Analysis Report, Revision 1,"April 27, 2017.
3. W3F1-2014-0024, "10 CFR 50.46 Significant Change Report for the Waterford 3 Emergency Core Cooling System Performance Analysis Due to Implementation of the Replacement Steam Generators," March 2014.

Notes:

None