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L-PI-20-032
10 CFR 50.46

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

Prairie Island Nuclear Generating Plant, Units 1 and 2
Docket Nos. 50-282 and 50-306
Renewed Facility Operating License Nos. DPR-42 and DPR-60

2019 10 CFR 50.46 LOCA Annual Report

Reference 1) Westinghouse Letter LTR-LIS-20-21 "Prairie Island Units 1 and 2 10 CFR 50.46 Annual Notification and Reporting for 2019"

Pursuant to 10 CFR 50.46(a)(3)(ii), Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), submits the 2019 annual report of changes and errors associated with the Prairie Island Nuclear Generating Plant (PINGP) Units 1 and 2 Emergency Core Cooling System (ECCS) analyses (Enclosure 1).

The peak cladding temperature (PCT) for PINGP Unit 1 and Unit 2 were unchanged since the last annual report for the LOCA analyses. The plant specific changes and errors (absolute value) since the last annual report are summarized below:

LBLOCA Unit 1
None

SBLOCA Unit 1
None

LBLOCA Unit 2
None

SBLOCA Unit 2
None

There were no changes that resulted in more than a 0 degree Fahrenheit PCT penalty. Enclosure 1 contains the 10 CFR 50.46 PCT Rack-up sheets addressed in the report. A retired PCT rack-up sheet for Unit 1 is included for traceability since 2019 is the first year following the initial date of its retirement.

If there is any question or if any additional information is needed, please contact Carrie Seipp at 612-330-5576.

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

A handwritten signature in black ink, appearing to read "Scott Sharp". The signature is fluid and cursive, with a large, sweeping flourish at the end.

Scott Sharp
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosure (1)

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island Nuclear Generating Plant, USNRC
Resident Inspector, Prairie Island Nuclear Generating Plant, USNRC

ENCLOSURE 1

Westinghouse Letter LTR-LIS-20-21 "Prairie Island Units 1 and 2 10 CFR 50.46 Annual
Notification and Reporting for 2019"

16 Pages Follow



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Our ref: LTR-LIS-20-21

February 11, 2020

**Prairie Island Units 1 and 2
10 CFR 50.46 Annual Notification and Reporting for 2019**

Dear Sir or Madam:

This is a notification of 10 CFR 50.46 reporting information pertaining to the Westinghouse Electric Company Evaluation Models/analyses. As committed to in WCAP-13451, Westinghouse Methodology for Implementation of 10 CFR 50.46 Reporting, Westinghouse is providing an Annual Report for Emergency Core Cooling System (ECCS) Evaluation Model changes and errors for the 2019 model year. All necessary standardized reporting pages for any changes and errors for the Evaluation Models utilized for your plant(s) are enclosed, consistent with the commitment following the NUPIC audit in early 1999. Peak Clad Temperature (PCT) summary sheets are enclosed. All necessary revisions for any non-zero, non-discretionary PCT changes have been included. Changes with estimated PCT impacts of 0°F may not be presented on the PCT summary sheet. The Evaluation Model changes and errors (except any plant-specific errors in the application of the model) have been provided to the NRC via Westinghouse letter.

Evaluations for Units 1 and Unit 2 were performed in 2015 to assess the impact of utilizing the Westinghouse integral fuel burnable absorber (IFBA) product in addition to the Gadolinia (Gad) burnable absorbers. Cycle 31 is the first Unit 2 cycle that will implement the use of IFBA in conjunction with Gadolinium; therefore, large and small break loss-of-coolant accident reporting text and a large break LOCA PCT summary sheet applicable to Unit 2 are included in the 2019 annual report. As requested in a meeting held on March 19th, 2018 between Westinghouse and Xcel Energy to discuss how to handle Thermal Conductivity Degradation (TCD), the original Pressurized Water Reactor Owners Group (PWROG) TCD effect of 227°F is included on the IFBA/Gad PCT summary sheet.

This information is for your use in making a determination relative to the reporting requirements of 10 CFR 50.46. The information that is provided in this letter was prepared in accordance with Westinghouse's Quality Management System (QMS). Please contact your LOCA plant cognizant engineer (PCE), Danial Utley (412-374-6663), if there are any questions concerning this information.

Lead Author: (Electronically Approved)*
William C. Lowe

Co-Author: (Electronically Approved)*
Heather McMillen

Verified: (Electronically Approved)*
Danial Utley

Approved: (Electronically Approved)*
Kent W. Bonadio

Attachment: 10 CFR 50.46 Reporting Text and PCT Summary Sheets (14 Pages)

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

GENERAL CODE MAINTENANCE

Background

Various changes have been made to enhance the usability of codes and to streamline future analyses. Examples of these changes include improving the input diagnostic checks; enhancing the code output; optimizing active coding; and eliminating inactive coding. These changes represent Discretionary Changes that will be implemented on a forward-fit basis in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Model(s)

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

Estimated Effect

The nature of these changes leads to an estimated peak cladding temperature impact of 0°F.

REMOVAL OF THE VESSEL INTERFACIAL HEAT TRANSFER LIMIT

Background

The Westinghouse Code Qualification Document (CQD) Best-Estimate Large-Break LOCA (BE LBLOCA) evaluation model (EM) is documented in WCAP-12945-P-A [1]. A limit on the vessel interfacial heat transfer was implemented into the WCOBRA/TRAC code as presented in Equation 5-12 therein. The implementation of the limit was intended to prevent any extreme conditions which are detrimental to the robustness of the numerical method. During the licensing of the method, the application of the limit was found to have a small impact on predicted results as discussed in the response to RAI1-116 of WCAP-12945-P-A [1].

An error was found in the implementation of the vessel interfacial heat transfer limit which effectively negates the application of the limit. The error was corrected by removing the vessel interfacial heat transfer limit from the WCOBRA/TRAC code (as opposed to a direct correction of the error). Since the WCOBRA/TRAC code validation and sensitivity studies associated with the model from WCAP-12945-P-A [1] all contained the error, the removal of the limit preserves the existing validation basis and sensitivity study conclusions that were presented in the topical report. Based on the validation and RAI responses therein, it was concluded that the as-coded interfacial heat transfer models and condensation behavior was acceptable.

The removal of the vessel interfacial heat transfer limit represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model(s)

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

Estimated Effect

The removal of the vessel interfacial heat transfer limit was found to have negligible impact on the WCOBRA/TRAC code validation results. The validation results in combination with pressurized water reactor large break LOCA transient calculations and engineering judgement support an estimated peak cladding temperature impact of 0°F.

Reference

- 1) WCAP-12945-P-A, Volume I, Revision 2, Volumes II through V, Revision 1, "Code Qualification Document for Best Estimate LOCA Analysis," March 1998.

ERROR IN UPTF TEST 20 SIMULATIONS

Background

An error was discovered in the WCOBRA/TRAC model for the simulations of the Upper Plenum Test Facility (UPTF) Test 20 series, which support the validation basis for modeling upper plenum injection (UPI) phenomena. A zero-flow boundary condition was applied for a particular channel at an elevation in the reactor vessel model that is inconsistent with the intended elevation and inconsistent with the description in WCAP-14449-P-A, Revision 1. This represents an error in the evaluation model, and the correction of this error represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Affected Evaluation Model(s)

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

Estimated Effect

The effect of the error correction on the overall UPTF Test 20 simulation results was evaluated to have a negligible impact, such that the code validation remains valid and the estimated Peak Cladding Temperature (PCT) impact is 0°F.

IMPLEMENTATION OF FUEL ASSEMBLIES CONTAINING ZrB_2 (IFBA) OR A COMBINATION OF IFBA AND Gd_2O_3 (GAD) FUEL RODS**Background**

Xcel Energy is planning to transition from a Gd_2O_3 (Gad) burnable absorber to a ZrB_2 Integral Fuel Burnable Absorber (IFBA) or a combination of IFBA and Gad fuel rods in each fuel assembly for Prairie Island Unit 2 (NRP). This item represents a change in plant configuration, distinguished from an evaluation model change in Section 4 of WCAP-13451.

Affected Evaluation Model(s)

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

Based on a qualitative evaluation, it was determined that implementation of fuel assemblies containing IFBA fuel rods or a combination of IFBA and Gad fuel rods is acceptable for the Prairie Island Unit 2 small break loss-of-coolant accident (SBLOCA) analysis, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.

EVALUATION OF THE INTRODUCTION OF IFBA FUEL

Background

Prairie Island Unit 2 (NRP) desire to employ an operating strategy utilizing the Westinghouse integral fuel burnable absorber (IFBA) product in addition to the Gadolinia (Gad) burnable absorbers already in use at NRP. This change requires an evaluation for the Prairie Island Unit 2 large break loss-of-coolant accident (LBLOCA) analysis of record (AOR). This evaluation represents a change in plant configuration or associated set point, distinguished from an evaluation model change in Section 4 of WCAP-13451.

Affected Evaluation Model(s)

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

Estimated Effect

To establish the effect of IFBA fuel, the HOTSPOT code was executed with IFBA fuel performance data for all 124 runs for both feed and non-feed fuel. IFBA fuel was found to be bounded by non-IFBA fuel, and was thus assigned an estimated PCT effect of 0°F.

LOCA Peak Cladding Temperature (PCT) Summary

Plant Name: PRAIRIE ISLAND 1
Utility Name: Xcel Energy, Inc
EM: NOTRUMP
AOR Description: Appendix K Small Break
Summary Sheet Status: Current

	PCT (°F)	Reference #	Note #
ANALYSIS-OF-RECORD	959	1	

AOR + ASSESSMENTS **PCT = 959.0 °F**

REFERENCES

- 1 LTR-LIS-08-158, "Transmittal of Future Prairie Island Units 1 and 2 PCT Summaries," February 2008.

NOTES:

- (a) None

Version: PRAIRIE ISLAND 1 NSP_LOCA-50.46_NSP_Base_Appendix_K_SBLOCA – 1.2 V.V

LOCA Peak Cladding Temperature (PCT) Summary

Plant Name:	PRAIRIE ISLAND 1
Utility Name:	Xcel Energy, Inc
EM:	ASTRUM (2004)
AOR Description:	Best Estimate Large Break
Summary Sheet Status:	Retired

	PCT (°F)	Reference #	Note #	
ANALYSIS-OF-RECORD	1765	1		
ASSESSMENTS*	Delta PCT (°ΔF)	Reference #	Note #	Reporting Year**
1. Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	227	2	(a)	2012
2. Revised Heat Transfer Multiplier Distributions	-2	3		2013
3. Error in Burst Strain Application	25	4		2013
AOR + ASSESSMENTS		PCT = 2015.0 °F		

* The licensee should determine the reportability of these assessments pursuant to 10 CFR 50.46.

** The "Reporting Year" refers to the annual reporting year in which this assessment was included.

REFERENCES

- 1 WCAP-17783-P, "Best-Estimate Analysis of the Large-Break Loss-of-Coolant Accident for Prairie Island Units 1 and 2 with Replacement Steam Generators Using ASTRUM Methodology," June 2013.
- 2 LTR-LIS-12-414, "Prairie Island Units 1 and 2, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 2012.
- 3 LTR-LIS-13-366, Revision 1, "Prairie Island Units 1 and 2 10 CFR 50.46 Report for Revised Heat Transfer Multiplier Distributions," August 2013.
- 4 LTR-LIS-14-50, "Prairie Island Units 1 and 2 10 CFR 50.46 Report for the HOTSPOT Burst Strain Error Correction," January 2014.

NOTES:

- (a) This evaluation credits peaking factor burndown, see Reference 2.

Version: PRAIRIE ISLAND 1 NSP_LOCA-50.46_NSP_Base_ASTRUM – 1.2 V.V

LOCA Peak Cladding Temperature (PCT) Summary

Plant Name: PRAIRIE ISLAND 1
Utility Name: Xcel Energy, Inc
EM: ASTRUM (2004)
AOR Description: Best Estimate Large Break
Summary Sheet Status: IFBA/Gad

	PCT (°F)	Reference #	Note #	
ANALYSIS-OF-RECORD	1765	1		
ASSESSMENTS*	Delta PCT (°ΔF)	Reference #	Note #	Reporting Year**
1. Revised Heat Transfer Multiplier Distributions	-2	3		2013
2. Error in Burst Strain Application	25	4		2013
3. Evaluation of the Introduction of IFBA Fuel	0	2		2018
4. Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	227	5	(a)	2012
AOR + ASSESSMENTS		PCT = 2015.0 °F		

* The licensee should determine the reportability of these assessments pursuant to 10 CFR 50.46.

** The "Reporting Year" refers to the annual reporting year in which this assessment was included.

REFERENCES

- 1 WCAP-17783-P, "Best-Estimate Analysis of the Large-Break Loss-of-Coolant Accident for Prairie Island Units 1 and 2 with Replacement Steam Generators Using ASTRUM Methodology," June 2013.
- 2 LTR-LIS-15-287, Rev. 1, "Prairie Island Units 1 and 2, 10 CFR 50.46 Notification and Reporting for the Revised Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown Evaluation and the Introduction of IFBA Fuel," September 2015.
- 3 LTR-LIS-13-366, Revision 1, "Prairie Island Units 1 and 2 10 CFR 50.46 Report for Revised Heat Transfer Multiplier Distributions," August 2013.
- 4 LTR-LIS-14-50, "Prairie Island Units 1 and 2 10 CFR 50.46 Report for the HOTSPOT Burst Strain Error Correction," January 2014.

Version: PRAIRIE ISLAND 1 NSP_LOCA-50.46_NSIFBA_GAD_ASTRUM – 1.3 V.V

- 5 LTR-LIS-12-414, "Prairie Island Units 1 and 2, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 2012.

NOTES:

- (a) This evaluation credits peaking factor burndown, see Reference 5.

Version: PRAIRIE ISLAND 1 NSP_LOCA-50.46_NSP_IFBA_GAD_ASTRUM – 1.3 V.V

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LOCA Peak Cladding Temperature (PCT) Summary

Plant Name: PRAIRIE ISLAND 2
Utility Name: Xcel Energy, Inc
EM: NOTRUMP
AOR Description: Appendix K Small Break
Summary Sheet Status: Current

	PCT (°F)	Reference #	Note #
ANALYSIS-OF-RECORD	959	1,2	a

AOR + ASSESSMENTS PCT = 959.0 °F

REFERENCES

- 1 LTR-LIS-08-158, "Transmittal of Future Prairie Island Units 1 and 2 PCT Summaries," February 2008.
- 2 LTR-LIS-13-274, "Prairie Island Units 1 and 2, 10 CFR 50.46 Summary Sheets for the Evaluation to Support the Unit 2 Installation of AREVA Model 56/19 Replacement Steam Generators (RSGs)," June 2013.

NOTES:

- (a) The Unit 1 AOR is applicable to Unit 2 with the RSGs installed.

Version: PRAIRIE ISLAND 2 NRP_LOCA-50.46_NRP_Base_Appendix_K_SBLOCA – 1.2 V.V

LOCA Peak Cladding Temperature (PCT) Summary

Plant Name: PRAIRIE ISLAND 2
Utility Name: Xcel Energy, Inc
EM: ASTRUM (2004)
AOR Description: Best Estimate Large Break
Summary Sheet Status: Current

	PCT (°F)	Reference #	Note #	
ANALYSIS-OF-RECORD	1765	1		
ASSESSMENTS*	Delta PCT (°ΔF)	Reference #	Note #	Reporting Year**
1. Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	227	2	(a),(b)	2012
2. Revised Heat Transfer Multiplier Distributions	-2	3		2013
3. Error in Burst Strain Application	25	4		2013
AOR + ASSESSMENTS		PCT = 2015.0 °F		

* The licensee should determine the reportability of these assessments pursuant to 10 CFR 50.46.

** The "Reporting Year" refers to the annual reporting year in which this assessment was included.

REFERENCES

- 1 WCAP-17783-P, "Best-Estimate Analysis of the Large-Break Loss-of-Coolant Accident for Prairie Island Units 1 and 2 with Replacement Steam Generators Using ASTRUM Methodology," June 2013.
- 2 LTR-LIS-12-414, "Prairie Island Units 1 and 2, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 2012.
- 3 LTR-LIS-13-366, Revision 1, "Prairie Island Units 1 and 2 10 CFR 50.46 Report for Revised Heat Transfer Multiplier Distributions," August 2013.
- 4 LTR-LIS-14-50, "Prairie Island Units 1 and 2 10 CFR 50.46 Report for the HOTSPOT Burst Strain Error Correction," January 2014.

NOTES:

- (a) This evaluation credits peaking factor burndown, see Reference 2.
- (b) The reporting text and line item originally identified for Unit 1 in Reference 2 is applicable to Unit 2 with RSGs.

Version: PRAIRIE ISLAND 2 NRP_LOCA-50.46_NRP_Base_ASTRUM – 1.1 V.V

LOCA Peak Cladding Temperature (PCT) Summary

Plant Name: PRAIRIE ISLAND 2
Utility Name: Xcel Energy, Inc
EM: ASTRUM (2004)
AOR Description: Best Estimate Large Break
Summary Sheet Status: IFBA/Gad

	PCT (°F)	Reference #	Note #
ANALYSIS-OF-RECORD	1765	1	

ASSESSMENTS*	Delta PCT (°ΔF)	Reference #	Note #	Reporting Year**
1. Revised Heat Transfer Multiplier Distributions	-2	3		2013
2. Error in Burst Strain Application	25	4		2013
3. Evaluation of the Introduction of IFBA Fuel	0	2		2019
4. Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	227	5	(a)	2012

AOR + ASSESSMENTS **PCT = 2015.0 °F**

* The licensee should determine the reportability of these assessments pursuant to 10 CFR 50.46.

** The "Reporting Year" refers to the annual reporting year in which this assessment was included.

REFERENCES

- 1 WCAP-17783-P, "Best-Estimate Analysis of the Large-Break Loss-of-Coolant Accident for Prairie Island Units 1 and 2 with Replacement Steam Generators Using ASTRUM Methodology," June 2013.
- 2 LTR-LIS-15-287, Rev. 1, "Prairie Island Units 1 and 2, 10 CFR 50.46 Notification and Reporting for the Revised Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown Evaluation and the Introduction of IFBA Fuel," September 2015.
- 3 LTR-LIS-13-366, Revision 1, "Prairie Island Units 1 and 2 10 CFR 50.46 Report for Revised Heat Transfer Multiplier Distributions," August 2013.
- 4 LTR-LIS-14-50, "Prairie Island Units 1 and 2 10 CFR 50.46 Report for the HOTSPOT Burst Strain Error Correction," January 2014.
- 5 LTR-LIS-12-414, "Prairie Island Units 1 and 2, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 2012.

Version: PRAIRIE ISLAND 2 NRP_LOCA-50.46_NRP_IFBA_GAD_ASTRUM – 1.3 V.V

NOTES:

- (a) This evaluation credits peaking factor burndown, see Reference 5.

Version: PRAIRIE ISLAND 2 NRP_LOCA-50.46_NRP_IFBA_GAD_ASTRUM – 1.3 V.V

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10 CFR 50.46 Reporting SharePoint Site Check:

**EMs applicable to Prairie Island:
Realistic Large Break – ASTRUM (2004)
Appendix K Small Break – NOTRUMP**

2019 Issues

Transmittal Letter	Issue Description
None	None