



Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, MN 55089

JUN 28 2017

L-PI-17-030
10 CFR 50.46

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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

2016 10 CFR 50.46 LOCA Annual Report

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 2016 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 degrees Fahrenheit PCT penalty. Enclosure 1 contains the 50.46 PCT Rack-up sheets addressed in the report.

If there is any question or if any additional information is needed, please contact Frank Sienczak, at 651-267-1740.



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Summary of Commitments

This letter contains no new commitments and no changes to existing commitments.

A handwritten signature in black ink that reads 'Scott Northard'.

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

Enclosure

cc: Regional 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-17-45 (Reference 1 of this letter)

10 Pages Follow



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Our ref: LTR-LIS-17-45

February 8, 2017

**Prairie Island Units 1 and 2
10 CFR 50.46 Annual Notification and Reporting for 2016**

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 2016 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) sheets are enclosed. All necessary revisions for any non-zero, non-discretionary PCT changes have been included. Non-discretionary PCT impacts of 0°F will generally not be presented on the PCT sheet. The Evaluation Model changes and errors (except any plant-specific errors in the application of the model) will be provided to the NRC via Westinghouse letter.

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.

Author: (Electronically Approved)*
Heather McMillen
LOCA Integrated Services II

Verified: (Electronically Approved)*
Danial W. Utley
LOCA Integrated Services II

Approved: (Electronically Approved)*
Matthew B. Cerrone
Manager, LOCA Integrated Services II

Attachment: 10 CFR 50.46 Reporting Text and PCT Summary Sheets (9 Pages)

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

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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 modifying input variable definitions, units and defaults; 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 (PCT) impact of 0°F.

ERROR IN OXIDATION CALCULATIONS

Background

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 large break loss-of-coolant accident (LOCA) calculation. This issue has been evaluated to estimate the impact on the Automated Statistical Treatment of Uncertainty Method (ASTRUM) and the Best-Estimate (BE) Large-Break Loss-of-Coolant Accident (LBLOCA) licensing-basis analysis results. The resolution of this issue 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

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 for 10 CFR 50.46 reporting purposes.

ERROR IN USE OF ASME STEAM TABLES**Background**

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 Automated Statistical Treatment of Uncertainty Method (ASTRUM) Best-Estimate (BE) Large-Break Loss-of-Coolant Accident (LBLOCA) analysis results. The resolution of this issue 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

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 for 10 CFR 50.46 reporting purposes.

PRAIRIE ISLAND UNITS 1 AND 2 UPPER PLENUM FLUID VOLUME

Background

The upper plenum fluid volume modeled in the small-break loss-of-coolant accident (SBLOCA) analysis for Prairie Island Units 1 and 2 was found to be underpredicted. The resolution of this issue represents a Non-Discretionary Change to the Evaluation Model as described in Section 4.1.2 of WCAP-13451.

Affected Evaluation Model(s)

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

A qualitative evaluation was performed which concluded that the change in upper plenum fluid volume has a negligible impact on the small break LOCA analysis results, leading to an estimated Peak Cladding Temperature (PCT) impact of 0°F.

Westinghouse LOCA Peak Clad Temperature Summary for ASTRUM Best Estimate Large Break

Plant Name: Prairie Island Unit 1
 Utility Name: Xcel Energy, Inc
 Revision Date: 2/8/2017

Analysis Information

EM: ASTRUM (2004) Analysis Date: 11/30/2007 Limiting Break Size: Split
 FQ: 2.5 FdH: 1.77
 Fuel: 422 Vantage + SGTP (%): 10
 Notes:

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	1765	1	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	227	2	(a)
2 . Revised Heat Transfer Multiplier Distributions	-2	3	
3 . Error in Burst Strain Application	25	4	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. 2016 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		

LICENSING BASIS PCT + PCT ASSESSMENTS PCT = 2015

* 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 . 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 20, 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.

Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Small Break

Plant Name: Prairie Island Unit 1
Utility Name: Xcel Energy, Inc
Revision Date: 2/8/2017

Analysis Information

EM: NOTRUMP **Analysis Date:** 1/21/2008 **Limiting Break Size:** 3 inch
FQ: 2.5 **FdH:** 1.77
Fuel: 422 Vantage+ **SGTP (%):** 10
Notes: Zirlo® (14X14), Framatome RSG

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	959	1	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . None	0		
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. 2016 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	PCT = 959		

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

Notes:

None

Westinghouse LOCA Peak Clad Temperature Summary for ASTRUM Best Estimate Large Break

Plant Name: Prairie Island Unit 2
Utility Name: Xcel Energy, Inc
Revision Date: 2/8/2017

Analysis Information

EM: ASTRUM (2004) **Analysis Date:** 11/30/2007 **Limiting Break Size:** Split
FQ: 2.5 **FdH:** 1.77
Fuel: 422 Vantage + **SGTP (%):** 10
Notes:

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	1765	1	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	227	2	(a), (b)
2 . Revised Heat Transfer Multiplier Distributions	-2	3	
3 . Error in Burst Strain Application	25	4	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. 2016 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		

LICENSING BASIS PCT + PCT ASSESSMENTS **PCT = 2015**

* 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 . 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 20, 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.

Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Small Break

Plant Name: Prairie Island Unit 2
Utility Name: Xcel Energy, Inc
Revision Date: 2/8/2017

Analysis Information

EM: NOTRUMP **Analysis Date:** 1/21/2008 **Limiting Break Size:** 3 inch
FQ: 2.5 **FdH:** 1.77
Fuel: 422 Vantage + **SGTP (%):** 10
Notes: Zirlo@ (14X14), AREVA RSG

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	959	1, 2	a
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . None	0		
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. 2016 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	PCT = 959		

* 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-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.

10 CFR 50.46 Reporting SharePoint Site Check:

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

2016 Issues

Transmittal Letter	Issue Description
LTR-LIS-16-444	10 CFR 50.46 Reporting Text for Incorrect LUCIFER2 Upper Plenum Fluid Volume for Prairie Island Units 1 and 2 (NSP/NRP)