



2807 West County Road 75
Monticello, MN 55362

December 11, 2023

L-MT-23-042
10 CFR 50.46(a)(3)(ii)

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

Monticello Nuclear Generating Plant
Docket No. 50-263
Renewed Facility Operating License No. DPR-22

2023 Annual Report of Changes in Emergency Core Cooling System Evaluation Models Pursuant to 10 CFR 50.46

References:

1. Correspondence, L-MT-22-046, Shawn C. Hafen to U.S. Nuclear Regulatory Commission, "2022 Annual Report of Changes in Emergency Core Cooling System Evaluation Models Pursuant to 10 CFR 50.46," December 13, 2022.
2. Global Nuclear Fuel (GNF) Correspondence KGO-NMC-EK1-23-080, Kimberly O'Connor (GNF) to Sonja Jenko (Xcel Energy), "Monticello 10 CFR 50.46 Reporting Period of July 2022 to July 2023," dated September 29, 2023.
3. Framatome Report FS1-0068817, Revision 1.0, "Monticello 10 CFR 50.46 PCT Reporting Estimates for ATRIUM 10XM and ATRIUM 11 Fuel - September 2022 to September 2023," dated September 2023.
4. ANP-3720P Revision 0, "Monticello LOCA MAPLHGR Limits for EPU/EFW with ATRIUM 10XM Fuel and Revised Modeling Parameters," January 2019.
5. ANP-3934P Revision 0 "Monticello LOCA Analysis for ATRIUM 11 Fuel" dated July 2021.
6. Framatome Report FS1-0064057, Revision 1.0 "Monticello 10 CFR 50.46 PCT Reporting Estimates for ATRIUM 10XM and ATRIUM 11 Fuel – September 2021 to September 2022" dated September 2022.

Pursuant to 10 CFR 50.46(a)(3)(ii), the Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, is providing this annual report concerning changes or errors identified in the Emergency Core Cooling System (ECCS) evaluation models for the Monticello Nuclear Generating Plant (MNGP).

GNF GE14 fuel and Framatome ATRIUM 10XM fuel and Framatome ATRIUM 11 fuel

were in the Monticello core. Atrium 11 fuel was first inserted in the Monticello core in April 2023; therefore, this will be the first 50.46 submittal to reference ATRIUM 11 fuel. This report is for the period from July 2022 to July 2023.

The last annual report was transmitted on December 13, 2022 (Reference 1).

Global Nuclear Fuel GE14 Fuel

The Nuclear Analysis Department requested from the fuel vendor, Global Nuclear Fuel, any applicable 10 CFR 50.46 notification of errors or changes that have occurred during the reporting period from July 2022 to July 2023. Correspondence from Global Nuclear Fuel (Reference 2) noted that no notifications were made in this period.

Attached in Enclosure 1 is the PCT rack-up for GE14 fuel for Monticello. This current adjusted PCT of < 2156°F remains the same as the one provided in Enclosure 1 of the 2022 Annual Report (Reference 1).

Framatome ATRIUM 10XM Fuel

The Nuclear Analysis Department requested from the fuel vendor, Framatome Inc., any applicable 10 CFR 50.46 notifications of errors or changes that have occurred during the reporting period from July 2022 to July 2023. Correspondence from Framatome, Inc. (Reference 3 and 6) noted that no non-zero notifications were made during this period.

ANP-3720P (Reference 4) is the current analysis of record and provides a baseline for Framatome ATRIUM 10XM fuel at Monticello. Attached in Enclosure 2 is the PCT rack-up for ATRIUM 10XM fuel for Monticello. This current adjusted PCT of 2144°F remains the same as the one provided in Enclosure 2 of the 2022 Annual Report. (Reference 1)

Framatome ATRIUM 11

The Nuclear Analysis Department requested from the fuel vendor, Framatome Inc., any applicable 10 CFR 50.46 notifications of errors or changes that have occurred during the reporting period from July 2022 to July 2023. Correspondence from Framatome Inc. (Reference 3 and 6) noted that no non-zero notifications were made during this period.

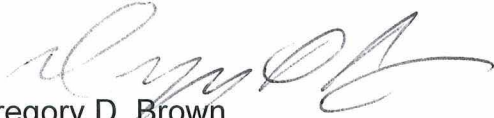
ANP-3934P (Reference 5) is the current analysis of record and provides a baseline for Framatome ATRIUM 11 fuel for Monticello. Attached in Enclosure 3 is the PCT rack-up for ATRIUM 11 fuel for Monticello. This current adjusted PCT of 2120°F remains unchanged from the Analysis of Record (Reference 5).

Should you have questions regarding this letter, please contact Mr. David Gerads at (763) 295-1046 (w).

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Summary of Commitments

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



Gregory D. Brown
Plant Manager, Monticello Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosure (3)

cc: Administrator, Region III, USNRC
Project Manager, Monticello, USNRC
Resident Inspector, Monticello, USNRC

ENCLOSURE 1

MONTICELLO NUCLEAR GENERATING PLANT

**TABLE 1 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS
INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR GE14
FUEL**

3 Pages Follow

TABLE 1 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR GE14 FUEL

Applicable Analysis or Error/Change Description	Ref.	Licensing Basis PCT(°F) GE14
NEDC-33322P, Revision 3, Safety Analysis Report for Monticello Constant Pressure Power Uprate	G1 & G2	<2140
<p>PRIME Fuel Properties Implementation for Fuel Rod T/M Performance, replacing GESTR Fuel Properties (10 CFR 50.46 Notification Letter 2012-01, Revision 1)</p> <p>This change is due to the application of an NRC-approved procedure to estimate the change in Peak Clad Temperature (PCT) due to the change in fuel properties from GESTR to PRIME primarily to address inaccuracies in fuel pellet thermal conductivity as a function of exposure.</p>	G3	+10
<p>SAFER04A E4-Mass Non-Conservatism (10 CFR 50.46 Notification Letter 2014-02)</p> <p>This change is due to a logic error that occurs when upper plenum liquid mass and core spray flow rate are low. System mass is gradually lost due to core spray being discarded, resulting in marginally less ECCS flow credited as reaching the core.</p>	G4	+15
<p>SAFER04A E4-Minimum Core DP Model (10 CFR 50.46 Notification Letter 2014-03)</p> <p>This change is due to the use of a minimum Δp that could be non-conservative offering inappropriate steam cooling benefit above the core two-phase level.</p>	G5	+20
<p>SAFER04A E4-Bundle/Lower Plenum CCFL Head (10 CFR 50.46 Notification Letter 2014-04)</p> <p>This change is due to the counter current flow limitation (CCFL) calculation representing the pressure head slightly different from that of the calculated water level in the bundle.</p>	G6	-15
Modified performance characteristics of the RHR (LPCI) and core spray (LPCS) systems.	G8	-14
SAFR Lower Limit on Differential Pressure for Bypass Leakage	G9	0

TABLE 1 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR GE14 FUEL

Applicable Analysis or Error/Change Description	Ref.	Licensing Basis PCT(°F) GE14
PRIME Coding Errors for Zircaloy Irradiation Growth and Zr Barrier Thermal Conductivity as input to ECCS LOCA Analysis	G10	0
Error in Fuel Pellet to Plenum Spring Conductance	G11	0
Discrepancy in Inner Cladding Surface Roughness	G12	0
Sum of absolute value of changes for the current reporting period.		0
Sum of absolute value of changes since last AOR (Reference G1).		74
Algebraic sum of changes for the current reporting period		0
Algebraic sum of changes since last AOR (Reference G1).		+16
Current Adjusted Peak Cladding Temperature		<2156

References

- G1. GE Report: NEDC-33322P Revision 3, "Safety Analysis Report for Monticello Constant Pressure Power Uprate," dated October 2008 (Enclosure 5 of L-MT-08-052, dated November 5, 2008, ADAMS Accession No. ML083230111)
- G2. NSPM letter to NRC, "Monticello Extended Power Uprate and Maximum Extended Load Line Limit Analysis Plus License Amendment Requests: Supplement for Analytical Methods Used to Address Thermal Conductivity Degradation and Analytical Methods Limitations (TAC Nos. MD9990 and ME3145)," L-MT-13-053 dated July 8, 2013 (ADAMS Accession No. ML13191A568).
- G3. GEH 10 CFR 50.46 Notification Letter 2012-01, Revision 1, "PRIME Fuel Properties Implementation for Fuel Rod T/M Performance, replacing GESTR Fuel Properties," dated July 30, 2013.
- G4. GEH 10 CFR 50.46 Notification Letter 2014-02, "SAFER04A E4-Mass Non-Conservatism," dated May 21, 2014.
- G5. GEH 10 CFR 50.46 Notification Letter 2014-03, "SAFER04A E4-Minimum Core DP Model," dated May 21, 2014.
- G6. GEH 10 CFR 50.46 Notification Letter 2014-04, "SAFER04A E4-Bundle/Lower Plenum CCFL Head," dated May 21, 2014.

TABLE 1 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR GE14 FUEL

- G7. L-MT-14-101, letter from K. Fili (NSPM) to NRC “2014 Annual Report of Changes in Emergency Core Cooling System Evaluation Models Pursuant to 10 CFR 50.46,” December 30, 2014.
- G8. GE Report 0000-0163-2998 R0 "Monticello ECCS LOCA Evaluation for Modified Low Pressure ECCS Injection Performance Curves (LPCS and LPCI)" dated July 25, 2013.
- G9. GEH 10 CFR 50.46 Notification Letter 2019-05, “SAFER Lower Limit on Differential Pressure for Bypass Leakage”, dated October 23, 2019.
- G10. GEH 10 CFR 50.46 Notification Letter 2020-01, “PRIME Coding Errors for Zircaloy Irradiation Growth and Zr Barrier Thermal Conductivity as Input to ECCS LOCA Analysis, dated April 14, 2020.
- G11. GNF Notification Letter 2021-01 “Error in Fuel Pellet to Plenum Spring Conductance”, dated February 18, 2021.
- G12. GNF Notification Letter 2021-02 “Corrections Implemented by the RDX2_2_RDX4 code for the TCD Factor calculation for the EXEM BWR-2000 LOCA Method,” Framatome, September 2, 2021.

ENCLOSURE 2

MONTICELLO NUCLEAR GENERATING PLANT

**TABLE 2 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING
CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR ATRIUM 10XM FUEL**

2 Pages Follow

TABLE 2 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR ATRIUM 10XM FUEL

Applicable Analysis or Error/Change Description	Ref.	Licensing Basis PCT(°F)
ANP-3720P Revision 0, "Monticello LOCA MAPLHGR Limits for EPU/EFW with ATRIUM 10XM Fuel and Revised Modeling Parameters	A1	2125
FS1-0048088 Revision 0, Monticello 10 CFR 50.46 PCT Error Reporting – Heat-up Analysis Input and RODEX4 Routine Issues	A2	0
Framatome Condition Report 2021-1456 "Incorrect Parameters Input to Monticello ATRIUM 11 LOCA Database".	A3	+19
RDX2_2_RDX4 Corrections	A4	0
RODEX4 Pellet Rim Porosity Model*	A5	0
Sum of absolute value of changes for the current reporting period.		0
Sum of absolute value of changes since last AOR (Reference A1)		19
Algebraic sum of changes for the current reporting period		0
Algebraic sum of changes since the last AOR (Reference A1)		+19
Current Adjusted Peak Cladding Temperature		2144

*The 0° PCT RODEX4 Pellet Rim Porosity Model error occurred outside the reporting period for this letter but is included since the error has been identified and listed in Framatome Report FS1-0068817 Revision 1.0 (Reference 3).

References

- A1. ANP-3720P Revision 0, Monticello LOCA MAPLHGR Limits for EPU/EFW with ATRIUM 10XM Fuel and Revised Modeling Parameters, Framatome, January 2019.
- A2. FS1-0048088 Revision 0, Monticello 10 CFR 50.46 PCT Error Reporting – Heat-up Analysis Input and RODEX4 Routine Issues, Framatome, February 2020.
- A3. Framatome Condition Report 2021-1456 "Incorrect Parameters Input to Monticello ATRIUM 11 LOCA Database", June 16, 2021.
- A4. Framatome Condition Report 2021-2025 "Corrections Implemented by the RDX2_2_RDX4 code for the TCD Factor calculation for the EXEM BWR-2000 LOCA Method", September 2, 2021.

**TABLE 2 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING
CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR ATRIUM 10XM FUEL**

A5. Framatome Condition Report 2023-1602 “Rim Porosity Model in RODEX4
Inconsistent with Theory Manual”, July 2023.

Enclosure 3

MONTICELLO NUCLEAR GENERATING PLANT

**TABLE 3 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING
CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR ATRIUM 11 FUEL**

1 Page Follows

TABLE 3 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR ATRIUM 11 FUEL

Applicable Analysis or Error/Change Description	Ref.	Licensing Basis PCT(°F)
ANP-3934P Revision 0, "Monticello LOCA Analysis for ATRIUM 11 Fuel," Framatome Inc., July 2021	A1	2120
S-RELAP5 cladding thermal conductivity	A2	0
Cladding hydrogen content	A2	0
MB2 ACE input with explicit water rod model	A3	0
Cladding Oxide thickness	A2	0
RODEX4 Pellet Rim Porosity Model*	A4	0
Sum of absolute value of changes for the current reporting period.		0
Sum of absolute value of changes since last AOR (Reference A1)		0
Algebraic sum of changes for the current reporting period		0
Algebraic sum of changes since the last AOR (Reference A1)		0
Current Adjusted Peak Cladding Temperature		2120

*The 0° PCT RODEX4 Pellet Rim Porosity Model error occurred outside the reporting period for this letter but is included since the error has been identified and listed in Framatome Report FS1-0068817 Revision 1.0 (Reference 3).

References

- A1. ANP-3934P Revision 0, "Monticello LOCA Analysis for ATRIUM 11 Fuel," Framatome, July 2021
- A2. Condition Report 2022-0152, "AURORA-B Inputs to RODEX4 – Resinter Density, Initial Oxide Thickness, and Initial Hydrogen Content," Framatome Inc., January 2022
- A3. Framatome Condition Report 2022-1650, "MICROBURN-B2 Explicit Water Rod Model Flow Inappropriately Included in Inlet Node for ACE Calculations," Framatome Inc., June 2022
- A4. Framatome Condition Report 2023-1602 "Rim Porosity Model in RODEX4 Inconsistent with the Theory Manual", July 2023