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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

2016 Annual Report of Changes in Emergency Core Cooling System Evaluation Models Pursuant to 10 CFR 50.46

References:

1) NSPM (T. O'Connor) to NRC, "License Amendment Request: Extended Power Uprate (TAC MD9990)," L-MT-08-052, dated November 5, 2008

2) NSPM (M. Schimmel) 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

3) NSPM (P. Gardner) to NRC, "2015 Annual Report of Changes in Emergency Core Cooling System Evaluation Models Pursuant to 10 CFR 50.46," L-MT-15-091, dated December 22, 2015

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). The MNGP Loss of Coolant Accident (LOCA) analyses of record (AOR) are contained in the General Electric – Hitachi (GEH) reports submitted for the MNGP Extended Power Uprate and the Maximum Extended Load Line Limit Analysis Plus (MELLLA+) license amendments (References 1 and 2).

Provided within Enclosure 1 is a report concerning any changes or errors identified in the GEH ECCS evaluation models for the MNGP. This report is for the period between July 2015 and July 2016 for the GEH fuel. The core for the current operating cycle (Cycle 28) consists solely of the GE14 fuel type. During this period no notifications of any changes or errors resulting in a change to the calculated Peak Clad Temperature (PCT) were received from GEH.

Therefore, the licensing basis PCT of less than 2170°F for the GE14 fuel and the PCT summary provided in the 2015 annual report is unchanged (Reference 3).

The 2017 Refueling Outage (RFO), scheduled for early 2017, will be the first loading of the AREVA ATRIUM 10XM fuel type into the MNGP core (Cycle 29).[1] Pursuant to 10 CFR 50.46(a)(3)(ii), NSPM is providing within Enclosure 2 a report concerning any changes or errors identified in the AREVA ECCS evaluation models for MNGP for the period between July 2015 and July 2016. During this reporting period, AREVA provided two notification letters involving a total of nine specific changes or errors, resulting in a minus 5°F change, and an adjusted licensing basis PCT of less than 2083°F for the ATRIUM 10XM fuel type.

Summary of Commitments

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

Peter A. Gardner
Site Vice President, Monticello Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosures: (2)

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

1. Until all the GE14 fuel is permanently discharged from the MNGP core, annual reports will continue to be provided for the associated GEH evaluation models, pursuant to 10 CFR 50.46. While both GE14 and ATRIUM 10XM fuel are in the core, NSPM intends to provide an annual report to include both the GEH and AREVA changes.

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

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
PRIME Fuel Properties Implementation for Fuel Rod T/M Performance, replacing GESTR Fuel Properties (10 CFR 50.46 Notification Letter 2012-01, Revision 1) 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.	G3	+10
SAFER04A E4-Maintenance Update Changes (10 CFR 50.46 Notification Letter 2014-01) This change is for a new version (E4) of SAFER04A that resolves several accumulated observations that are code maintenance items. Sensitivity calculations show these items have an insignificant effect on calculated PCT.	G4	+0
SAFER04A E4-Mass Non-Conservatism (10 CFR 50.46 Notification Letter 2014-02) 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.	G5	+15
SAFER04A E4-Minimum Core DP Model (10 CFR 50.46 Notification Letter 2014-03) 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.	G6	+20

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
SAFER04A E4-Bundle/Lower Plenum CCFL Head (10 CFR 50.46 Notification Letter 2014-04) 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.	G7	-15
Sum of absolute value of changes for the current reporting period, which includes all changes since the 10 CFR 50.46 report.		0
Sum of absolute value of changes since last AOR.		60
Algebraic sum of changes for the current reporting period, which includes all changes since the 10 CFR 50.46 report.		+0
Algebraic sum of changes since last AOR.		+30
Current Adjusted Peak Cladding Temperature		<2170

References

G1. GE Report: NEDC-33322P Revision 3, "Safety Analysis Report for Monticello Constant Pressure Power Uprate," dated October 2008 (Enclosure 5 of NSPM (T. O'Connor) to NRC, "License Amendment Request: Extended Power Uprate (TAC MD9990)," L-MT-08-052, dated November 5, 2008)

G2. NSPM (M. Schimmel) 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

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 2014-01, "SAFER04A E4-Maintenance Update Changes," dated May 21, 2014

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

References

G5. GEH 10 CFR 50.46 Notification Letter 2014-02, "SAFER04A E4-Mass Non-Conservatism," dated May 21, 2014.

G6. GEH 10 CFR 50.46 Notification Letter 2014-03, "SAFER04A E4-Minimum Core DP Model," dated May 21, 2014.

G7. GEH 10 CFR 50.46 Notification Letter 2014-04, "SAFER04A E4-Bundle/Lower Plenum CCFL Head," dated May 21, 2014.

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

TABLE 1 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR AREVA 10XM FUEL

Applicable Analysis or Error/Change Description	Ref.	Licensing Basis PCT(°F) 10XM
ANP-3212(P) Revision 0, Monticello EPU LOCA-ECCS Analysis MAPLHGR Limits for ATRIUM™ 10XM Fuel	A1	<2088
Implementation of ACE in RELAX. The approved interpolation scheme required by Licensing Topical Report (LTR) EMF-2361 (Section 3.2.2) was not employed when the ACE Critical Heat Flux (CHF) correlations were implemented in RELAX.	A2	+0
Modified Analysis Approach (1). Extraneous messages written in RELAX minor edits can impact the modified analysis approach. This error did not impact the limiting PCT.	A2	+0
Modified Analysis Approach (2). The performance of a specific action under the modified analysis approach is overly conservative. This error did not impact the limiting PCT.	A2	+0
Modified Analysis Approach (3). The time when a specific action under the modified analysis approach began might be incorrectly reported in the documentation of the calculation. The error did not impact the time used in any of the MNGP LOCA calculations.	A2	+0

TABLE 1 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR AREVA 10XM FUEL

Applicable Analysis or Error/Change Description	Ref.	Licensing Basis PCT(°F) 10XM
Low Pressure Coolant Injection (LPCI) Loop Selection Logic. Relates to an input error when modeling breaks smaller than 0.4 ft^2. MNGP has instrumentation and logic to detect which recirculation line contains a break. When a break is detected, the logic injects all LPCI flow into the recirculation line that does not contain the break and closes the discharge isolation valve in that same recirculation line. If a break is not detected, the LPCI flow is injected and the discharge isolation valve is closed in a predefined recirculation line. LOCA analyses for breaks smaller than 0.4 ft^2 conservatively assumed the break was in the recirculation line that was predefined to receive the LPCI flow and should have closed the discharge isolation valve in the same recirculation line. Instead, the discharge isolation valve was modeled as closing in the intact recirculation line.	A2	+0
End of Blowdown. A modeling assumption was made that could result in an error in the time when rated Low Pressure Core Spray (LPCS) is reached. The time when rated LPCS flow is reached is used in two parts of the LOCA calculation and it relates to the use of the modified analysis approach. This error did cause a small change in the time when the heat transfer coefficients in the heatup calculation change from the calculated values to the values specified in 10 CFR 50 Appendix K.	A2	-5
Modeling Assumption for Time of Bypass Reflood. A modeling assumption could result in an error in the time of bypass reflood. The time of bypass reflood is the time the heat transfer coefficient beneath the bypass mixture level is set to 25 Btu/hr- ft^2 -°F.	A2	+0

TABLE 1 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR AREVA 10XM FUEL

Applicable Analysis or Error/Change Description	Ref.	Licensing Basis PCT(°F) 10XM
Using End-of-Blowdown (EOB) Time for Selecting HUXY Boundary Conditions. At the EOB (which is the time of rated core spray), the hottest axial slab in the RELAX hot channel calculation is identified. This establishes the boundary conditions that are passed into the HUXY calculation. While this is appropriate under some conditions when the slabs continue to heat up after EOB, it may not be appropriate for other conditions when the EOB time is much later and the nodes have cooled down.	A2	+0
Pressure Permissive for Closing Recirculation Discharge Isolation Valve (RDIV) during Single Loop Operation (SLO). Monticello has two recirculation lines. Each line has a location for injecting LPCI flow and a RDIV on the discharge side of the recirculation pump. Monticello also has Loop Selection Logic which will route all of the LPCI flow to the unbroken loop and close the RDIV in the same loop. During SLO the pressure must be less than or equal to 900 psig before the RDIV will begin to close. This pressure permissive during SLO was not modeled in the SLO LOCA calculations. Evaluations were performed that indicate modeling the pressure permissive would not impact the limiting SLO break. This issue does not impact a LOCA initiated during Two-Loop Operation (TLO) because the RDIV pressure permissive is modeled correctly. Therefore, this issue has zero impact on the limiting PCT.	A3	+0
Sum of absolute value of changes for the current reporting period, which includes all changes since the 10 CFR 50.46 report.		+0
Sum of absolute value of changes since last AOR.		5
Algebraic sum of changes for the current reporting period, which includes all changes since the 10 CFR 50.46 report.		+0
Algebraic sum of changes since last AOR.		-5
Current Adjusted Peak Cladding Temperature		<2083

TABLE 1 – SUMMARY OF MONTICELLO LOCA CHANGES AND ERRORS INVOLVING CHANGES IN PEAK CLADDING TEMPERATURE (PCT) FOR AREVA 10XM FUEL

References

A1. AREVA Report ANP-3212(P) Revision 0, "Monticello EPU LOCA-ECCS Analysis MAPLHGR Limits for ATRIUM™ 10XM Fuel," AREVA NP, May 2013 (Enclosure 20 of NSPM letter to NRC, "License Amendment Request for Transition to AREVA ATRIUM 10XM Fuel and AREVA Safety Analysis Methodology," L-MT-13-055, dated July 15, 2013

A2. AREVA Report FS1-0026440 Revision 1, "Monticello 10 CFR 50.46 PCT Reporting Estimates for ATRIUM 10XM Fuel," approved May 13, 2016

A3. AREVA Report FS1- 0029081 Revision 1, "Monticello 10 CFR 50.46 PCT Reporting Estimates for ATRIUM 10XM Fuel – Through July 2016," approved October 12, 2016