UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 19, 2015

Peter A. Gardner
Site Vice-President
Northern States Power Company – Minnesota
Monticello Nuclear Generating Plant
2807 West County Road 75
Monticello, MN 55362-9637

SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT – RELIEF REQUEST RR-009 REGARDING RELIEF FROM EXAMINATION COVERAGE REQUIREMENTS OF SECTION XI OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE FOR THE FIFTH 10-YEAR INSERVICE INSPECTION PROGRAM INTERVAL (TAC NO. MF4258)

Dear Mr. Gardner:

By letter dated June 6, 2014, Northern States Power Company - Minnesota (NSPM, the licensee), doing business as Xcel Energy, submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain examination coverage requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, for the Monticello Nuclear Generating Plant (MNGP).

Specifically, pursuant to Title 10 of the *Code of Federal* Regulations (10 CFR), Section 50.55a(g)(5)(iii), NSPM requested authorization of an alternative to the examination coverage requirements of the ASME Code, Section XI, Table IWB-2500-1, Category B-D, Item B3.90, and proposes to utilize completed examinations as acceptable alternatives that provide reasonable assurance of continued structural integrity. Pursuant to 10 CFR 50.55a(a)(6)(i), the licensee requested relief and to use alternative requirements on the basis that the required 100 percent examination coverage is impractical due to physical obstructions and the limitations imposed by design, geometry and materials of construction.

The NRC staff has reviewed MNGP request RR-009 and concludes, as set forth in the enclosed safety evaluation, that NSPM has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(a)(6)(i) and remains in compliance with ASME Code requirements. Therefore, the NRC staff authorizes proposed alternative request RR-009 for the fifth 10-year inservice inspection interval of the Inservice Inspection Program for MNGP which is currently scheduled to conclude on May 31, 2022.

If you have any questions, please contact Terry Beltz at (301) 415-3049 or via e-mail at Terry.Beltz@nrc.gov.

Sincerely,

David L. Pelton, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-263

Enclosure:
Staff Evaluation of the Fifth 10-Year Inservice
Inspection Interval Relief Request RR-009

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE FIFTH 10-YEAR INSERVICE INSPECTION PROGRAM INTERVAL

RELIEF REQUEST RR-009

MONTICELLO NUCLEAR GENERATING PLANT

NORTHERN STATES POWER COMPANY – MINNESOTA

DOCKET NO. 50-263

1.0 INTRODUCTION

By letter dated June 6, 2014 (Agencywide Documents Access and Management System Accession No. ML14157A205), Northern States Power Company - Minnesota (NSPM, the licensee), doing business as Xcel Energy, submitted a relief request RR-009 for the Monticello Nuclear Generating Plant (MNGP). The licensee requested relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," as it applies to five welds in the nozzles of the reactor recirculation suction, reactor recirculation inlet, feedwater inlet, core spray inlet, and jet pump instrumentation.

The NRC staff's evaluation of the licensee's proposed request is provided below.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the pre-service examination requirements, as set forth in the Section XI of the ASME Code to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(g)(5)(iii), if a licensee has determined that conformance with a code requirement is impractical for its facility, the licensee shall notify the NRC and submit information to support the determination. Following evaluation of the determination, pursuant to 10 CFR 50.55a(g)(6)(i), the Commission may grant relief and impose alternative requirements that are determined to be authorized by law and will not endanger life, property or the common defense and security and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Pursuant to 10 CFR 50.55a(g)(6)(i), NSPM requested relief from the ASME Code requirements. The ASME Code of record for fifth 10-year interval inservice inspection program, which started

on September 1, 2012, and is projected to end on May 31, 2022, is the 2007 Edition with the 2008 Addenda, of Section XI of ASME Code.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to grant the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components

The components affected by this request are ASME Code, Section XI, Class 1, reactor pressure vessel (RPV) nozzle-to-vessel welds as specified below:

Recirculation Suction	Nozzle N-1A	Weld N-1A NV
Recirculation Inlet	Nozzle N-2D	Weld N-2D NV
Feedwater Inlet	Nozzle N-4C	Weld N-4C NV
Core Spray Inlet	Nozzle N-5B	Weld N-5B NV
Jet Pump Instrumentation	Nozzle N-8A	Weld N-8A NV

3.2 Applicable Code Requirements

ASME Class 1 reactor pressure vessel welds are subject to the examination requirements of Subsection IWB, Table IWB-2500-1, as shown below, and by 10 CFR 50.55a(b)(2)(xv)(G). The welds are required to be examined once within the Fifth Ten-Year Interval:

Code Class:	1
References:	Nozzle-to-Vessel Welds
Examination Category:	B-D, Full Penetration Welded Nozzles in Vessels
Item Number:	B3.90
Description:	Nozzle-to-Vessel Welds
Component Numbers:	See Section 3.1 (above)
System:	Reactor Vessel
Examination Method:	Volumetric-Ultrasonic Testing
Examination Volume:	Figure IWB-2500-7(b)

The NRC issued Regulatory Guide (RG) 1.147, Revision 16, "ISI Code Case Acceptability, ASME Section XI, Division 1," in 2010. RG 1.147, Revision 16, identifies ASME Code Cases that the NRC has determined to be acceptable alternatives to applicable parts of Section XI, and states that licensees may utilize these Code Cases without requesting authorization from the NRC staff provided that they are used with no identified limitations or modifications. Table 1 of RG 1.147, Revision 16, lists ASME Code Case N-613-1, "Ultrasonic Examination of Full Penetration Nozzles in Vessels, Examination Category B-D, Item Nos. B3.10 and B3.90, Reactor Nozzle-To-Vessel Welds, Figs. IWB-2500-7(a), (b), and (c) Section XI, Division 1," and is considered as being acceptable to the NRC staff for use by a licensee with no identified limitations or modifications.

ASME Code Case N-613-1, as an alternative to Figure IWB-2500-7(b) required for RPV nozzle-to-vessel welds, permits an examination volume that includes the width of the weld plus one-half (½) inch of adjacent base metal on each side of the widest part of the weld. In comparison, the

examination volume required by the Figure IWB-2500-7(b) includes the width of the weld plus the adjacent base metal on each side of the widest part of the weld equal to one-half of the vessel shell wall thickness.

When the Code required examination volume cannot be met, provisions in ASME Code, Section XI, Non-Mandatory Appendix S "Evaluating Coverage for Section XI Nondestructive Examination" may be used as a guideline to determine examination coverage. Article S-3000, specifically Sub-Article S-3500, provides examination coverage evaluation guidelines for ultrasonic (UT) examination of welds.

NRC Information Notice (IN) 98-42 "Implementation of 10 CFR 50.55a(g) Inservice Inspection Requirements" dated January 1, 1999, addresses conditions when ASME Code examination coverage is less than "essentially 100%" and provides a definition for "Essentially 100 Percent." IN 98-42 states in part:

"The NRC has adopted and further refined the definition of 'essentially 100 percent' to mean 'greater than 90 percent'. This standard has been applied to all examinations of welds or other areas required by ASME Section XI."

3.3 Licensee's Impracticality of Compliance (as stated)

The MNGP construction permit CPPR-31 was obtained in 1967. The MNGP systems and components were designed for construction before the examination requirements of ASME Section XI were formalized and published. Therefore, MNGP was not specifically designed to meet the requirements of ASME Code, Section XI, and full compliance is not feasible or practical within the limits of the current plant design.

10 CFR 50.55a recognizes the limitations to inservice inspection of components in accordance with Section XI of the ASME Code imposed due to early plants' design and construction, as follows:

- 10 CFR 50.55a(g)(1): For a boiling or pressurized water-cooled nuclear power facility whose construction permit was issued before January 1, 1971, components (including supports) must meet the requirements of paragraphs (g)(4) and (g)(5) of this section to the extent practical.

- 10 CFR 50.55a(g)(4): Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except design and access provisions and pre-service examination requirements, set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code ... to the extent practical within the limitations of design, geometry and materials of construction of the components.

- 10 CFR 50.55a(g)(5)(iii): If the licensee has determined that conformance with a code requirement is impractical for its facility, the licensee shall notify the NRC and submit, as specified in § 50.4, information to support the determinations.

The inspection limitations on the subject components are due to inherent component design geometric contours and physical scanning obstructions. The licensee provided a description of

the examination methodology used to achieve the examination. The methodology is based on ASME Code, Section XI, Appendix VIII, qualification and was applied to the extent practical within the design constraints of the components. Enclosure 3 of the licensee's June 6, 2014, letter provides cross-sectional diagrams of the subject welds showing the geometric contour of the component design in relation to the welds and the coverage obtained within the examination volume requirements of ASME Code Case N-613-1, Figure 2, for the RPV nozzle-to-vessel shell welds.

3.4 Licensee's Proposed Alternative and Basis

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief for the components listed in Subsection 3.1 on the basis that the required examination coverage of "essentially 100 percent" is impractical due to both physical obstructions and limitations imposed by design, geometry, and materials of construction.

The licensee performed volumetric examinations that achieved the maximum, practical amount of coverage obtainable within the limitations imposed by the design of the components with no detected indications.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested authorization of an alternative to the examination coverage requirements of ASME Section XI Table IWB-2500-1, Category B-D, Item B3.90, and proposes to utilize these completed exams as acceptable alternatives that provide reasonable assurance of continued structural integrity.

3.5 NRC Staff's Evaluation

The licensee achieved the following percentages of examination volume coverage for the subject five welds during the 2013 refueling outage inspection.

Component	Nozzle Number	Weld Number	Exam Coverage
RPV Recirc Suction	N-1A	N-1A NV	83%
RPV Recirc Inlet	N-2D	N-2D NV	82%
RPV Feedwater Inlet	N-4C	N-4C NV	79%
Core Spray Inlet	N-5B	N-5B NV	81%
Jet Pump Instrumentation	N-8A	N-8A NV	83%

The ASME Code requires essentially 100 percent volumetric examination for ASME Code Class 1 full penetration welded nozzles in vessels as listed in the table above. However, complete volumetric examinations of the subject nozzle welds are limited due to inherent component design geometric contours and physical scanning obstructions. In order to effectively increase the examination coverage, the nozzle welds would require design modifications. This would place a burden on the licensee to redesign, and install the subject components and welds; thus, 100 percent ASME Code-required volumetric examinations are considered to be impractical.

The licensee's non-destructive examination (NDE) ultrasonic testing (UT) procedures incorporate inspection techniques qualified under Appendix VIII of the ASME Code, Section XI, by the Performance Demonstration Initiative (PDI). The examinations of the RPV nozzle-to-shell welds were performed from the reactor vessel exterior surface using a manual contact

method from the nozzle bend radius, the nozzle-to-vessel shell weld, and vessel shell surface. The licensee obtained coverage using the alternative examination volume permitted by Code Case N-613-1 by following the scan parameters designated within its NDE procedures. The scans defined by the Electric Power Research Institute (EPRI) report are only applicable to the inner 15 percent of the weld volume when scanning in the parallel (circumferential) direction.

The refracted longitudinal wave mode of propagation was applied for all radial (axial) scans of the examination volume. The refracted longitudinal wave mode of propagation was also applied to the outer 85 percent of the examination volume for parallel scans. The shear wave mode of propagation was applied for each of the transducer and wedge combinations required for the remaining inner 15 percent of the parallel scan exam volume.

The nozzle-to-vessel welds were accessible from the vessel plate side of the weld and were examined to the extent practical with qualified techniques, however, the curvature of the nozzle forging and proximity to the weld and physical obstructions preclude obtaining further coverage of the excluded areas within the outer 85 percent of the examination volume. The licensee obtained coverage ranging from 79 percent to 83 percent of the required volumetric coverage for nozzle-to-shell welds N-1A NV, N-2D NV, N-4C NV, N-5B NV, and N-8A NV within the outer 85 percent of the examination volume. However, the licensee obtained 100 percent coverage for the inner 15 percent of the examination volume for the radial and parallel scans. For the examinations conducted, satisfactory results were achieved, and no flaw indications were detected. Based on the drawings and descriptions of the examination area provided by the licensee, the NRC staff determined that design of these nozzle-to-shell welds make it impractical for the licensee to effectively perform ASME Code required volumetric examination coverage of "essentially 100 percent."

The method used to determine coverage is based on field measurements applied to a two dimensional plot. This allows an informed approximation to be made of the coverage achieved. The methodology is appropriate to the application in that the limitations are physical and the methods applied to the examination are established by the qualified techniques.

The coverage drawings in Enclosure 3 of the licensee's June 6, 2014, letter provide a representation of the examination volume and the weld interface line shown in Figure 2 of ASME Code Case N-613-1 for the nozzle-to-vessel welds. The areas of examination volume coverage and areas of no examination coverage are identified on the respective drawing for each nozzle. The contour on the exterior surface of the nozzles causes transducer liftoff and inhibits the ability to maintain adequate coupling necessary to transmit and receive the ultrasonic sound energy.

Based on the volumetric coverage obtained for the subject welds, and considering the licensee's performance of UT techniques employed to maximize this coverage, it is reasonable to conclude that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed. Furthermore, the staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject components.

The materials for the subject components are A508 Cl II nozzle forgings welded to A533 Cl I vessel shell plate. The weld filler material for the subject joints was E8018NM. Internal surface cladding materials are E309-15 for the base layer, and ER308L or E308L-15 for subsequent layers.

Reactor vessel water chemistry at MNGP is controlled in accordance with the 2008 revision to the BWR Water Chemistry Guidelines specified in BWRVIP-190: BWR Vessel and Internals Project, BWR Water Chemistry Guidelines - 2008 Revision," EPRI Report 1016579, dated October 2008. A hydrogen water chemistry system is used to reduce the oxidizing environment in the reactor coolant. Beginning in 2013, an online noble metal chemistry program was implemented at MNGP. These additional measures provide further assurance for mitigation of crack growth due to intergranular stress corrosion cracking on the inner surface of the reactor vessel, and an inerted primary containment environment during operation provides added assurance of corrosion protection on the outside surface of the reactor vessel.

Additionally, as ASME Code Class 1 Examination Category B-P components, system pressure testing with VT-2 visual examinations are required every outage prior to startup. The VT-2 visual examinations were performed on the subject components in association with the reactor coolant pressure boundary system pressure test performed during the 2013 refueling outage. No evidence of pressure boundary leakage was identified during this system test.

4.0 CONCLUSION

Based on the above evaluation, the NRC staff determines that design of the nozzle-to-shell welds makes it impractical for the licensee to effectively perform ASME Code required volumetric examination coverage of "essentially 100 percent."

As set forth above, the NRC staff determines that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Furthermore, the staff determines that the examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject components. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i).

Therefore, the NRC staff grants relief for the subject examination of the component, as requested in RR-009, for the fifth 10-year ISI interval at MNGP which commended on September 1, 2012, and is projected to conclude on May 31, 2022.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Austin Young

Date of Issuance: February 19, 2015

If you have any questions, please contact Terry Beltz at (301) 415-3049 or via e-mail at Terry.Beltz@nrc.gov.

Sincerely,

/RA/

David L. Pelton, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-263

Enclosure:
Staff Evaluation of the Fifth 10-Year Inservice Inspection Interval Relief Request RR-009

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