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

August 13, 2014

Karen D. Fili
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 FROM EXAMINATION COVERAGE REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE, SECTION XI FOR THE FOURTH 10-YEAR INSERVICE INSPECTION PROGRAM INTERVAL (TAC NO. MF2654)

Dear Mrs. Fili:

By letter dated August 28, 2013, as supplemented by letter dated February 20, 2014, Northern States Power Company, a Minnesota corporation (NSPM, the licensee), doing business as Xcel Energy, submitted a relief request (RR) to the U.S. Nuclear Regulatory Commission (NRC). The relief would allow NSPM to achieve less than the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) required examination coverage for certain reactor vessel welds at the Monticello Nuclear Generating Plant (Monticello).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(i), the licensee requested relief and to use alternative requirements for inservice inspection (ISI) items on the basis that the code requirement is impractical. The relief would allow less that the ASME Code required examination coverage for nozzle-to-vessel welds N-1B NV and N-4D NV, and head-to-flange weld W-8, for the fourth 10-year ISI interval at Monticello.

The NRC staff has reviewed MNGP's RR No. 21 and determined, 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(g)(5)(iii). The staff concludes that the examinations already performed would have detected any significant degradation that may be present, providing reasonable assurance of the continued structural integrity of welds N-1B NV, N-4D NV, and W-8. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted for the fourth 10-year ISI interval at Monticello.

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 Fourth 10-Year
Inservice Inspection Interval Relief Request No. 21

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

RELATED TO THE FOURTH 10-YEAR INSERVICE INSPECTION PROGRAM INTERVAL

REQUEST NO. 21

MONTICELLO NUCLEAR GENERATING PLANT

NORTHERN STATES POWER COMPANY – MINNESOTA

DOCKET NO. 50-263

1.0 INTRODUCTION

By letter dated August 28, 2013, as supplemented by letter dated February 20, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML13241A236 and ML14052A147, respectively), Northern States Power Company (NSPM, the licensee), doing business as Xcel Energy, submitted its Fourth 10-year Interval Inservice Inspection (ISI) Program Plan Request for Relief (RR) No. 21, for the Monticello Nuclear Generating Plant (MNGP). The proposed relief request was submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(5)(iii), which allows requests for relief from impractical American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) requirements. Approval of this request would allow the licensee to credit those reactor vessel (RV) weld examinations already performed in meeting the ASME Code required examination coverage, but not achieving full 100 percent examination coverage due to inspection limitations from inherent design geometric contours and scanning interference.

Specifically, the licensee stated that during the MNGP fourth 10-year ISI interval, examinations of vessel-to-nozzle welds N-1B NV and N-4D NV, and head-to-flange weld W-8, did not meet ASME Code requirements for coverage. All of these welds were under the requirements of the 1995 Edition of the ASME Code with 1996 Addenda, Section XI, IWB-2500-1, Examination Category B-A, Item B1.40, and Examination Category B-D, Item B3.90, for the fourth 10-year ISI interval.

The U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of the licensee's proposed relief follows.

2.0 REGULATORY EVALUATION

Inservice inspection of ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Code and applicable addenda as required by 10 CFR, Section 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). Paragraph 55a(a)(3) of 10 CFR 50 states that alternatives to the requirements

of 10 CFR 50.55a(g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations also require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b), 12 months prior to the start of the 120-month interval and subject to the limitations and modifications listed therein.

The ASME Code of record for the fourth 10-year interval ISI program at MNGP, which ended on May 31, 2012, is the 1995 Edition through the 1996 Addenda of Section XI of the ASME Code.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components

The components affected by RR No. 21 are ASME Code, Section XI, Class 1, RV nozzle-to-vessel welds and the top head-to-flange weld specified in detail in Table A of Enclosure 2 of the licensee's August 28, 2013, application:

Component Description	Weld ID	Examination Category/Item
RV-to-Recirculation Suction Nozzle N-1B	Weld N-1B NV	B-D/B3.90
RV-to-Feedwater Inlet Nozzle N-4D	Weld N-4D NV	B-D/B3.90
RV Top Head-to-Flange	Weld W-8	B-A/B1.40

3.2 ASME Code Requirement

The ASME Code, Section XI, Examination Category B-A, Item B1.40 and B-D, and Item B3.90, requires 100 percent volumetric examination as defined in Figures IWB-2500-5 and IWB-2500-7 (a) through (d), as applicable, of Class 1 reactor pressure vessel (RPV) full penetration top head-to-flange and nozzle-to-shell welds. The licensee invoked ASME Code Case N-613-1 "Ultrasonic Examination of Full Penetration Nozzles to Vessels, Examination Category B-D, Item Nos. B3.10 and B3.90, Reactor Nozzle-to-Vessel Welds, Figures IWB-2500-7(a), (b) and (c), Section XI, Division 1", which is endorsed by the NRC in Regulatory Guide (RG) 1.147 and has been approved for general use without limitations. ASME Code Case N-613-1 allows a reduction of the examination volume next to the widest part of the weld from half of the vessel wall thickness to one-half (½) inch.

The licensee also invoked ASME Code Case N-460 "Alternative Examination Coverage for Class 1 and Class 2 Welds, ASME Section XI, Division 1" which is endorsed by the NRC in RG 1.147. Code Case N-460 states, in relevant part, that when the entire examination volume or area cannot be examined due to interference by another component or part geometry, a reduction in examination coverage on any Class 1 or Class 2 weld may be accepted provided the reduction in coverage for that weld is less than 10 percent. However, for each of the three component welds in this relief request, the reduction in coverage is greater than 10 percent, such that Code Case N-460 is not applicable to the welds in the relief request.

3.3 Licensee's Proposed Alternative Examination

In the application, the licensee stated the following:

> In accordance with 10 CFR 50.55a(g)(5)(iii), relief is requested for the components listed in Table A of enclosure 2 on the basis that the required examination coverage of "essentially 100 percent" is impractical due to physical obstructions and the limitations imposed by design, geometry and materials of construction.

NSPM 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. Additionally, as Class 1 Examination Category B-P components, a VT-2 examination is performed on the subject components of the Reactor Coolant Pressure Boundary (RCPB) during system pressure tests each refueling outage. This was completed during the MNGP refueling outage in 2011, and no evidence of leakage was identified for these components. In accordance with the requirements of Table IWB-2500-1, Examination Category B-A, Item B1.40, a surface examination was completed on the head-to-flange weld with no indications being detected.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), NSPM requests relief from the requirements of ASME [Code], Section XI, Table IWB-2500-1, Examination Category B-A, Item B1.40, and Examination Category B-D, Item B3.90, and proposes to utilize these completed exams as an acceptable alternative that provide reasonable assurance of continued structural integrity.

3.4 Licensee's Basis for Relief Request

The licensee based its relief request on the following:

Nozzle-to-Vessel Welds

The NSPM non-destructive examination (NDE) ultrasonic testing (UT) procedures incorporate improved inspection techniques qualified under Appendix VIII of the ASME Section XI Code, by the Performance Demonstration Initiative (PDI).

The examinations were performed using a manual contact method from the nozzle blend radius, the nozzle-to-vessel shell weld, and vessel shell surface. The shear wave mode of propagation was used for each of the transducer and wedge combinations required for the inner 15 percent of the required parallel scan volume. The refracted longitudinal wave mode of propagation was used for the remaining outer 85 percent of the volume for parallel scans, and

all of the radial (axial) scans.

According to the licensee, it was not feasible to perform a volumetric examination of "essentially 100 percent" of the volume due to the design of these welds.

The licensee stated that the subject components received the required examination(s) to the extent practical within the limited access of the component design. For the examinations conducted, the licensee stated that satisfactory results were achieved, and no evidence of unacceptable flaws was detected with the improved inspection techniques.

Head-to-Flange Weld

The licensee applied performance-based ultrasonic techniques qualified to the requirements of ASME Code, Section XI, Appendix VIII, Supplements 4 and 6, as modified by 10 CFR 50.55a(b)(2)(xv), using the provisions of IWA-2240 as a substitute for the amplitude-based examination techniques of ASME Section V, Article 4. As permitted by IWB-2500, alternative examination methods other than specified in Table IWB-2500-1 may be used when they meet the requirements of IWA-2240. Per IWA-2240, alternative examination methods, a combination of methods, or newly developed techniques may be substituted for the methods specified, provided the Inspector is satisfied that the results are demonstrated to be equivalent or superior to those of the specified method.

The examinations were performed using personnel and procedures qualified for single-sided examinations. An NDE procedure was developed to the PDI generic procedure PDI-UT-6, which has an applicable thickness range that envelops the nominal design thicknesses of the head-to-flange materials within the examination volume, and was used to perform the examination. The head-to-flange weld was examined from the exterior surface of the vessel head using a manual contact method. The refracted longitudinal wave mode of propagation was applied for all scans of the exam volume. According to the licensee, due to the design of the head-to-flange weld, "essentially 100 percent" of the required volume could not be obtained.

The licensee stated that the subject components received the required examination(s) to the extent practical within the limited access of the component design. For the examinations conducted, the licensee stated that satisfactory results were achieved and no evidence of unacceptable flaws was detected with the improved inspection techniques. In addition, a surface examination of the head-to-flange weld was performed for the entire weld length, as specified in the ASME Code for Item B1.40 welds, with no indications detected.

The licensee concluded that if significant degradation existed in the subject welds, it should have been identified by the examinations performed. Additionally, as Class 1 examination category B-P components, the licensee performed VT-2 examinations on the subject components in association with the RCPB system pressure test performed during the 2011 refueling outage, and no evidence of leakage was identified.

3.5 Licensee's Additional Information

In its letter dated February 20, 2014, the licensee provided additional information to explain the differences in examination coverage of reactor vessel head-to-flange weld W-8 between the third and fourth interval examinations. In its August 28, 2013, supplemental letter, the

licensee stated that the head-to-flange weld W-8 received 93 percent examination coverage in 2001 during the third interval examination, but received only 79 percent examination coverage in 2011 during the fourth interval examination.

In its response to the NRC staff's request for additional information, the licensee elaborated in its February 20, 2014, letter that the differences for examination coverage between the third and fourth intervals were due to changes in UT equipment and methodology. Specifically, the examination performed in 2011 utilized a performance-based technique and a 60-degree refracted longitudinal wave transducer which was mounted in a large housing with dimensions measuring 60 millimeters (mm) by 60mm. By contrast, the examination performed in 2001 used three separate but smaller transducers which measured roughly 25 mm in diameter for the longitudinal wave transducer, and roughly 25 mm on edge for the 45-degree and the 60-degree shear wave transducers. The larger footprint of the transducers used for the 2011 examination resulted in a loss of coupling for a larger percentage of the examination area, thus resulting in a smaller examination coverage area.

3.6 NRC Staff Evaluation

Section XI of the ASME Code requires 100 percent volumetric coverage of all Class 1 RPV nozzle-to-shell welds and head-to-flange welds. The subject welds were designed and fabricated before the examination requirements of Section XI were formalized and published. The geometry of the subject welds limits scanning such that 100 percent of the required examination coverage cannot be completed. Even with the allowances of Code Case N-460, "essentially 100 percent" coverage cannot be obtained. For the licensee to achieve the ASME Code-required volumetric coverage, the subject nozzles would have to be redesigned and modified. This would place an undue burden on the licensee. Therefore, based on provided drawings and technical description of the nozzles, the NRC staff determined that the ASME Code requirements are impractical.

Ultrasonic examination of these welds was conducted using personnel, equipment, and procedures qualified through the Electric Power Research Institute (EPRI) PDI program for ferritic pressure vessel welds. As shown on the sketches and technical descriptions provided by the licensee, a significant amount of the required volumetric coverage was obtained for the component welds (83 percent for the nozzle-to-vessel shell welds, and 79 percent for the vessel head-to-flange weld). Although the coverage of the head-to-flange weld during the fourth interval examination was reduced from 93 percent coverage during the third interval examination, the NRC staff considers the use of PDI-qualified techniques as a process improvement and that any drawbacks from the reduction in coverage are outweighed by the benefits of using PDI-qualified techniques.

Round robin tests, as discussed in NUREG/CR-5068, "Piping Inspection Round Robin," have demonstrated that ultrasonic examinations of ferritic material from a single side provide high probabilities of detection (usually 90 percent or greater) for both near- and far-side cracks in blind inspection trials. While the licensee may not have achieved complete examination coverage (from both sides) as required by the ASME Code, the ultrasonic examinations performed by the licensee from the vessel side of the carbon steel weld meet the inspection guidelines documented in NUREG/CR-5068. Additionally, these examinations were performed with personnel, equipment, and procedures that have been demonstrated to meet EPRI PDI Program qualification requirements.

For these reasons, the examinations performed are expected to detect any significant degradation that might have be present, thus providing reasonable assurance of the continued structural integrity and leak tightness of welds N-1B NV, N-4D NV, and W-8.

4.0 CONCLUSION

The NRC staff has reviewed RR No. 21 for Fourth 10-year Interval ISI Program Plan at MNGP. As set forth above, the staff determines that the examinations already performed would have detected any significant degradation that may be present, providing reasonable assurance of the continued structural integrity of welds N-1B NV, N-4D NV, and W-8. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted for the fourth 10-year ISI interval at MNGP.

As set forth above, the NRC staff has determined 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 giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

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

Principle Contributor: Joel Jenkins, NRR

Date of issuance: August 13, 2014

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

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Staff Evaluation of the Fourth 10-Year
Inservice Inspection Interval Relief Request No. 21

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