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

August 17, 2015

Mr. Kevin Davison
Site Vice President
Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota
1717 Wakonade Drive East
Welch, MN 55089

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2 – REQUESTS 1-RR-4-9 AND 2-RR-4-9 ASSOCIATED WITH THE FOURTH 10-YEAR INTERVAL FOR THE INSERVICE INSPECTION PROGRAM (TAC NOS. MF4795 AND MF4796)

Dear Mr. Davison:

By letter dated September 3, 2014, as supplemented by letter dated February 4, 2015, Northern States Power Company – Minnesota (NSPM, the licensee), doing business as Xcel Energy, submitted a request for relief from the requirements of the American Society of Mechanical Engineers Boiler (ASME) and Pressure Vessel Code (Code), Section XI, for the Prairie Island Nuclear Generating Plant (Prairie Island), Units 1 and 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(a)(3)(i) (retitled paragraph 50.55a(z)(1) by 79 FR 65776, dated November 5, 2014), the licensee submitted requests 1-RR-4-9, Revision 0, and 2-RR-4-9, Revision 0, to use an alternative to specific requirements of ASME Code, Section XI, IWC-5210(b)(1) and IWA-5211. The licensee proposed to perform alternative leakage testing to pressure test containment nitrogen lines to the safety injection (SI) accumulators, on the basis that the alternative examination provides an acceptable level of quality and safety.

While performing its evaluation of the requests, the U.S. Nuclear Regulatory Commission (NRC) staff determined that it would review the requests under 10 CFR 50.55a(a)(3)(ii) (retitled paragraph 50.55a(z)(2)), in lieu of paragraph 50.55a(a)(3)(i). The staff reviewed the proposed alternative and determined, as set forth in the enclosed safety evaluation, that NSPM adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2), and that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the SI accumulator nitrogen piping in containment. The staff finds that complying with the specified ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff authorizes the use of 1-RR-4-9 and 2-RR-4-9 at Prairie Island, Units 1 and 2, for the remainder of the fourth 10-year inspection interval of the Inservice Inspection Program, which commenced on December 21, 2004, and was scheduled to end on December 20, 2014, with extension through the end of the Unit 2 refueling outage (2R29).

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact Terry A. 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 Nos. 50-282 and 50-306

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via ListServ

UNITED STATES
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SAFETY EVALUATON BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FOR RELIEF REQUESTS 1-RR-4-9 AND 2-RR-4-9

REGARDING SYSTEM LEAKAGE TEST OF THE

SAFETY INJECTION ACCUMULATOR NITROGEN PIPING IN CONTAINMENT

NORTHERN STATES POWER COMPANY – MINNESOTA

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2

DOCKET NOS. 50-282 AND 50-306

1.0 INTRODUCTION

By letter dated September 3, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14247A639), as supplemented by letter February 4, 2015 (ADAMS Accession No. ML15036A283), Northern States Power Company – Minnesota (NSPM, the licensee), doing business as Xcel Energy, requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, associated with the fourth 10-year interval for the Prairie Island Nuclear Generating Plant (Prairie Island), Units 1 and 2, Inservice Inspection (ISI) Program.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(a)(3)(i), the licensee submitted requests 1-RR-4-9, Revision 0, and 2-RR-4-9, Revision 0, to use an alternative system leakage test for the safety injection (SI) accumulator nitrogen piping on the basis that proposed alternative would provide an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), the ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice 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.

Pursuant to 10 CFR 50.55a(z), alternatives to the requirements of paragraph (g) of 10 CFR 50.55a may be used when authorized by the Director, Office of Nuclear Reactor Regulation. A proposed alternative must be submitted and authorized prior to implementation. The licensee must demonstrate (1) the proposed alternative would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements of this section would

result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

By *Federal Register* notice 79 FR 65776, dated November 5, 2014, which became effective on December 5, 2014, the paragraphs headings in 10 CFR 50.55a were revised. Accordingly, relief requests that had been previously covered by 10 CFR 50.55a(a)(3)(i) are now covered under the equivalent 10 CFR 50.55a(z)(1) and relief requests that had been previously covered by 10 CFR 50.55a(a)(3)(ii) are now covered under the equivalent 10 CFR 50.55a(z)(2).

While performing its evaluation of the requests, the NRC staff determined that it would review the requests under 10 CFR 50.55a(a)(3)(ii) (retitled paragraph 50.55a(z)(2)), in lieu of paragraph 50.55a(a)(3)(i), and informed NSPM in an e-mail dated June 11, 2015 (ADAMS Accession No. ML15201A583). The staff reviewed the proposed alternative and determined that NSPM adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2), and that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the SI accumulator nitrogen piping in containment.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

3.0 TECHNICAL EVALUATION

The NRC staff's evaluation of the information provided by the licensee in support of the proposed alternative to the ASME Code requirements was evaluated and the bases for disposition are documented below.

3.1 Component Affected

The components affected are ASME Code Class 2. In accordance with the ASME Code, Section XI, IWC-2500 (Table IWC-2500-1), they are classified as Examination Category C-H, Item Number C7.10.

These components are the SI accumulator nitrogen piping inside the containment (Line Number 1-SI-19C for Unit 1, and Line Number 1-2SI-19A for Unit 2). The nitrogen piping in containment is 1-inch nominal pipe size (NPS) Schedule 80, composed of stainless steel (in Unit 1) and carbon steel (in Unit 2).

3.2 Applicable Code Edition and Addenda

The Code of record for the fourth 10-year ISI interval is the 1998 Edition through 2000 Addenda of the ASME Code.

3.3 Duration of Relief Request

The licensee submitted 1-RR-4-9 and 2-RR-4-9 for the fourth 10-year ISI interval, which was started on December 21, 2004, and was initially scheduled to end on December 20, 2014. The licensee stated that it will extend the fourth 10-year ISI interval up to the end of Unit 2 refueling

outage 2R29, which does not exceed one calendar year beyond December 20, 2014, as the extension of ISI interval within one calendar year is permitted according to IWA-2430.

3.4 ASME Code Requirement

The ASME Code, Section XI, IWC-5210(a), requires that the pressure retaining components shall be tested at the frequency stated in, and visually examined by the methods specified in Table IWC-2500-1, Examination Category C-H.

The ASME Code, Section XI, IWC-2500, Table IWC-2500-1, Examination Category C-H, requires the system leakage testing according to IWC-5220 and the VT-2 visual examinations according to IWA-5240 during each inspection period. In accordance with IWC-5221, the system leakage test shall be conducted at the system pressure obtained while the system, or portion of the system, is in service performing its normal operating function or at the system pressure developed during a test conducted to verify system operability (e.g., to demonstrate system safety function or satisfy technical specification surveillance requirements). In accordance with IWC-5222(a), the pressure-retaining boundary includes only those portions of the system required to operate or support the safety function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required.

In accordance with IWC-5210(b)(1), the system pressure tests and visual examinations shall be conducted according to IWA-5000 and IWC-5000. The contained fluid in the system shall serve as the pressurizing medium.

The requirement in IWC-5210(b)(2) states that, alternatively, steam systems may use either water or gas as the pressurizing medium. When gas is the pressurizing medium, the test procedure shall include methods for detection and location of through wall leakage from components of the system tested.

According to IWA-5211, pressure-retaining components within each system boundary shall be subject to the following applicable system pressure tests referenced in Table IWA-5210-1, under which conditions a VT-2 visual examination is performed in accordance with IWA-5240 to detect leakage.

According to IWA-5211(a), a system leakage test conducted while the system is in operation, during a system operability test, or while the system is at rest conditions using an external pressurization source.

3.5 Background

The licensee stated that during the first and second inspection periods of the fourth 10-year ISI interval, the nitrogen piping upstream of the nitrogen valves to each SI accumulator had a classification as ASME Code non-class. Therefore, the nitrogen piping upstream of the accumulator control valves was not subject to pressure testing in the first two periods of the fourth 10-year ISI interval. During 2010 to 2011, the licensee reclassified the nitrogen lines to the accumulators in the containment as ASME Code Class 2 because the lines had been

assigned safety functions to 1) maintain system pressure boundary (nitrogen); 2) provide accumulator safety injection; and 3) maintain containment operability.

3.6 Proposed Alternative

The licensee proposed an alternative to a specific requirement in IWC-5210(b)(1), and that is "The contained fluid in the system shall serve as the pressurizing medium." When the SI accumulator nitrogen piping is in service, the contained fluid is nitrogen gas. The proposed alternative is to perform a local leak rate test (LLRT) with station air once each inspection period in accordance with approved site procedures.

The licensee also proposed an alternative to a specific requirement in IWA-5211, and that is "a VT-2 visual examination is performed in accordance with IWA-5240 to detect leakage." The proposed alternative is to utilize LLRT instrumentation to detect leakage in the SI accumulator nitrogen piping following pressurization by air during system leakage test.

In its letter dated September 3, 2014, the licensee stated, in part, that

> The LLRT administrative leakage limit is 4000 [cubic centimeters per minute (cc/min)] at 46 [pounds per square inch gauge (psig)], the containment internal design pressure which exceeds the calculated containment internal pressure for the design basis loss of coolant accident. Leakage above the 4000 cc/min limit would require additional actions to determine the source of the leakage. Although the primary purpose of LLRT is to test containment isolation valves (CV-31440, CV-31441, CV-31444 and CV-31242 for Unit 1, and CV-31554, CV-31511, CV-3151, and CV-31244 for Unit 2), it also tests the nitrogen piping from the containment isolation valve to the nitrogen valves to each accumulator. The remaining [ASME Code] class nitrogen piping from the accumulator valves (CV-31441, CV-31444, CV-31511, and CV-31512) to the accumulators will be tested in accordance with [ASME Code, Section XI] requirements.

3.7 Basis for Hardship

In its letter dated September 3, 2014, the licensee stated, in part, that

> Pressure testing the lines in accordance with the [ASME Code] is complicated by the fact that the "contained fluid in the system" per to the requirements of IWC-5210(b)(1) is a colorless gas and would not show visual indication of leakage. Pressure testing with water is complicated by the fact that much of the piping is not readily accessible. In addition, a pressure test with water on a system designed for gas raises concerns with potential water hammer and drainage.

In its letter dated February 4, 2015, the licensee stated, in part, that

> Performance of the [leakage] test would require use of liquid leak detection solution (Snoop) on the piping since the fluid contained in the system is a colorless gas and would not show visual indication of leakage. The majority of

> the piping in this test scope for both units is immediately below the 711' floor elevation in the containment building, which is 14 feet above the 697' floor elevation. This area is very congested making building scaffold very difficult. For an inspector to perform a Snoop test of this piping or examine the piping for leakage, a significant amount of free climb would be required which could potentially result in an industrial safety hazard.

3.8 Basis for Use

In its letter dated September 3, 2014, the licensee stated, in part, that

> The SI accumulator nitrogen piping in containment is used to charge the SI system accumulators. The nitrogen supply valve, nitrogen containment isolation valve, and nitrogen valves to each accumulator are briefly opened to pressurize the SI accumulators to approximately 750 psig at the beginning of each fuel cycle. The containment nitrogen isolation valve and nitrogen valves to the accumulators are normally closed and only opened under administrative control.
>
> No degradation of the lines is expected since they provide inert gas service. As such, there is no significant risk of corrosion cracking or other degradation.

In its letter dated February 4, 2015, the licensee stated that the proposed alternative system leakage test will test "the affected components for both structural integrity and leak tightness to the extent needed to ensure system operability." In addition, the licensee stated, in part, that

> Since the affected components are isolated at power operation, the safety function of the components is to maintain containment integrity. The proposed LLRT is a combined local leak rate test of four control valves on each unit and the associated components. The test rig supplies air to the affected piping at a pressure of 46 psig which is the system pressure developed to verify system operability. The test demonstrates the components are leak tight to the extent required to maintain containment integrity by verifying the total leakage. including seat leakage through valves, is less than 4000 cc/min at the containment design pressure of 46 psig.

3.9 NRC Staff Evaluation

The NRC staff has evaluated 1-RR-4-9 and 2-RR-4-9 pursuant to 10 CFR 50.55a(z)(2). The NRC staff focused on whether compliance with the specified requirements of 10 CFR 50.55a(g), or portions thereof, would result in hardship or unusual difficulty, and if there is a compensating increase in the level of quality and safety despite the hardship.

3.9.1 Hardship

The NRC staff found that requiring the licensee to comply with IWC-5210(b)(1) and IWA-5211 to conduct system leakage test of the SI accumulator nitrogen piping in containment would result in hardship. The basis for the hardship is as follows. The nitrogen gas is colorless and the required VT-2 visual examination would not be able to detect a leakage initiated from a

through-wall crack in the pipe. In addition, use of water as a pressurizing medium is not possible due to potential for water hammer and the difficulty associated with draining water after testing. Since the majority of the piping under consideration is not readily accessible (i.e., located in a very congested area in the containment building or at elevation that requires scaffold to climb), the VT-2 visual examination becomes very challenging and performing the examination creates potential safety hazards for personnel.

3.9.2 Pressurizing Medium and Examination for Leakage

In evaluating the licensee's proposed alternative, the NRC staff assessed whether it appeared that the licensee used the appropriate pressurizing medium and leak-detection technique to conduct system leakage testing and the manner in which the licensee adequately preformed the testing. The NRC staff found that using air in place of nitrogen gas to pressurize these pipes to conduct system leakage testing is acceptable because air and nitrogen gas have similar properties with air being denser than nitrogen and pressurization of air is relatively easier to handle and less hazardous. The NRC staff also found that use of the LLRT device for detection of leakage in these pipes is acceptable because the LLRT device is a pressurized gas leakage detection device that has been generally used by utilities to detect containment isolation valve leakage. In addition, the visual detection of through-wall leak in the pipes pressurized by colorless and odorless gas (air or nitrogen) is not easily possible and most of the piping under consideration is inaccessible for direct visual examination.

3.9.3 Safety Significance of Alternative Pressurizing Medium and Leakage Detection

In evaluating the licensee's proposed alternative, the NRC staff assessed the safety significance of using air as a pressurizing medium and LLRT device for detecting through wall leakage to accomplish system leakage test of the SI accumulator nitrogen piping in containment. The NRC staff notes that the piping under consideration is made of either carbon steel or stainless steel. The degradation mechanism could be fatigue, corrosion, and stress-corrosion cracking. However, corrosion and stress-corrrosion cracking are not expected to be a problem with inert gas such as nitrogen. Fatigue crack is known to have relatively slow growth. Significant degradation would likely be detected by the proposed system leakage testing.

3.10 Summary

Based on the above, the NRC staff determined that (1) the proposed alternative will detect leakage from the subject piping but that it is not as sensitive to small leaks as the ASME Code requirement; (2) the safety significance associated with a small leak in the subject piping is extremely low; and (3) complying with the ASME Code requirement will result in a significant hardship or unusual difficulty, and that compliance with the ASME Code requirements for the pressure test would not result in a compensating increase in the level of quality and safety as required by 10 CFR 50.55a(z)(2).

4.0 CONCLUSION

As set forth above, the NRC staff finds that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2), and is in compliance with the requirements of 10 CFR 50.55a with the authorization of the proposed alternative.

The NRC staff further finds that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the SI accumulator nitrogen piping in containment. The NRC staff finds that complying with the specified ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Therefore, the NRC staff authorizes the use of 1-RR-4-9 and 2-RR-4-9 at Prairie Island, Units 1 and 2, for the remainder of the fourth 10-year inspection interval of the Inservice Inspection Program, which commenced on December 21, 2004, and was scheduled to end on December 20, 2014, with extension through the end of the Unit 2 refueling outage (2R29).

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Ali Rezai, NRR/DE/EPNB

Date: August 17, 2015

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact Terry A. 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 Nos. 50-282 and 50-306

Enclosure:
Safety Evaluation

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