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

May 29, 2020

Mr. Christopher R. Church
Senior Vice President and Chief
Nuclear Officer
Northern States Power Company - Minnesota
Monticello Nuclear Generating Plant
2807 West County Road 75
Monticello, MN 55362-9637

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

SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT AND PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2 - RELIEF FROM THE REQUIREMENTS OF THE ASME CODE (EPID L-2019-LLR-0078)

Dear Mr. Church and Mr. Sharp:

By letter dated August 16, 2019, as supplemented by letter dated February 14, 2020, Northern States Power Company (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of alternatives to certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, requirements at Monticello Nuclear Generating Plant (MNGP) and Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee requested to use the proposed alternative on the basis that complying with ASME Code, Section XI, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the proposed alternatives provide reasonable assurance of structural integrity of all ASME Code Class 2 and 3 moderate-energy carbon steel piping. The NRC staff finds that complying with the requirements of the ASME Code, Section XI, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC authorizes the use of relief request RR-013 for MNGP, relief request 1-RR-5-11 for PINGP, Unit 1, and relief request 2-RR-5-11 for PINGP, Unit 2, for the fifth inservice inspection intervals.

The NRC's approval of these three proposed alternatives does not imply or infer the NRC's approval of Code Case N-786-3 for the generic use.

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

If you have any questions, please contact the Senior Project Manager, Robert Kuntz at 301-415-3733 or via e-mail at Robert.Kuntz@nrc.gov.

Sincerely,

Scott P. Wall

Digitally signed by Scott P. Wall
Date: 2020.05.29 13:44:11 -04'00'

Nancy L. Salgado, Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-263, 50-282, and 50-306

Enclosure:
Safety Evaluation

cc: ListServ

SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT AND PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2 - RELIEF FROM THE REQUIREMENTS OF THE ASME CODE (EPID L-2019-LLR-0078) DATED May 29, 2020

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UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NOS. RR-013, 1-RR-5-11, AND 2-RR-5-11

ALTERNATE REPAIR OF ASME CODE CLASS 2 AND 3

MODERATE ENERGY CARBON STEEL PIPING

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT AND

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2

DOCKET NOS. 50-263, 50-282, AND 50-306

1.0 INTRODUCTION

By letter dated August 16, 2019, (Agencywide Documents and Access Management System (ADAMS) Accession No. ML19231A224), as supplemented by letter dated February 14, 2020 (ADAMS Accession No. ML20045E894), Northern States Power Company, a Minnesota Corporation, doing business as Xcel Energy (the licensee) requested relief from requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, IWA-4000 at Monticello Nuclear Generating Plant (MNGP) and Prairie Island Nuclear Generating Plant (PINGP) Units 1 and 2.

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee submitted relief requests RR-013 for MNGP, 1-RR-5-11 for PINGP, Unit 1, and 2-RR-5-11 for PINGP, Unit 2. The licensee proposed an alternate repair of all ASME Code Class 2 and 3 moderate-energy carbon steel piping using ASME Code Case N-786-3, “Alternative Requirements for Sleeve Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping,” on the basis that complying with ASME Code, Section XI, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), which states, in part, that ASME Code Class 1, 2, and 3 components will meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in Section XI of the ASME Code.

Regulation 10 CFR 50.55a(z) states that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation. A proposed alternative must be submitted

Enclosure

and authorized prior to implementation. The licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, and subject to the following technical evaluation, the U.S. Nuclear Regulatory Commission (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

3.1 ASME Code Component(s) Affected

The affected components are all ASME Code Class 2 and 3 moderate-energy carbon steel piping. Moderate energy is defined in NRC Branch Technical Position 3-3, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," as maximum operating temperature and pressure are less than or equal to 200 degree Fahrenheit (°F) and 275 pounds per square inch gauge (psig), respectively.

3.2 Applicable ASME Code Section XI Edition and Addenda

Plant	Interval	Edition	Start	End
MNGP	Fifth	2007 Edition through 2008 Addenda	September 1, 2012	May 31, 2022
PINGP Unit 1	Fifth	2007 Edition through 2008 Addenda	December 21, 2014	December 20, 2024
PINGP Unit 2	Fifth	2007 Edition through 2008 Addenda	December 21, 2014	December 20, 2024

3.3 Applicable Code Requirement

The ASME Code, Section XI, Article IWA-4000 provides requirements for welding, brazing, defect removal, metal removal by thermal means, and rerating. The ASME Code, Section XI, Article IWA-4000, also provides requirements for removing, adding, and modifying items or systems.

3.4 Reason for Request

The ASME Code, Section XI, Article IWA-4000, requires repair or replacement of degraded piping in accordance with plant owner's requirements and the original or later construction code. The request stated that the repair and replacement provisions of IWA-4000 cannot always be used when pipe degradation or leakage is identified during plant operation. The request further stated that other NRC-approved alternative repair or evaluation methods, such as weld overlays, are not always practicable because of wall thinning and/or moisture issues.

The request indicated that the proposed alternatives permit installation of temporary Type A and partial-structural Type B repairs to provide adequate time for evaluation, design, material procurement, planning and scheduling of an appropriate permanent repair or replacement of the

defective piping considering the impact on system availability, maintenance rule applicability, and availability of replacement materials.

According to the request, the alternatives also permit installation of permanent repairs using full-structural Type B reinforcing sleeves for locally degraded portions of piping. The design, construction, and inservice monitoring of such sleeves provide a technically sound equivalent replacement for the segment of piping that is encompassed, comparable to or exceeding the level of quality and safety associated with a permanent ASME Code repair or replacement.

The request stated that without these repair options, compliance with the specified requirements of IWA-4000 could in some cases necessitate taking a system out of service, resulting in extended technical specification actions and higher risks associated with loss of safety system availability. The request stated that plant shutdown could be necessary, resulting in higher risks associated with an unnecessary plant transient and loss of safety system availability as compared to maintaining the plant online.

The request noted that the ASME Code has approved Code Case N-786-3. However, the NRC has not approved the Code Case in Regulatory Guide 1.147, "In-service Inspection Code Case Acceptability, ASME Code, Section XI, Division 1." The Code Case is, therefore, not available for application at domestic nuclear power plants without specific prior NRC approval.

3.5 Proposed Alternative

The request proposed to implement the requirements of ASME Code Case N-786-3 to repair degraded ASME Code Class 2 and 3 moderate energy piping resulting from degradation mechanisms such as localized erosion, corrosion, cavitation, or pitting, but excluding cracking.

3.6 Basis for Use

The request stated that the repair described in Code Case N-786-3 uses full encirclement sleeve halves welded together longitudinally by full penetration seam welds to reinforce structural integrity in the degraded pipe area. As such, the request indicated that the existing flaw will not be removed when the sleeve is installed on the pipe.

Types of Sleeves

The Code Case specifies three types of sleeves. The Type A sleeve reinforces the degraded pipe area but provides no pressure-retaining function, as the ends of the sleeve are not welded to the pipe. The Type A sleeve relies on the repaired pipe to provide some structural (mechanical) and/or pressure-retaining integrity. The Type B sleeve is divided into the partial-structural Type B sleeve and full-structural Type B sleeve. The partial-structural Type B sleeve relies on the encased underlying piping to provide some structural and/or pressure-retaining integrity.

The full-structural Type B sleeve maintains full capability to withstand structural (bending, axial and torsional) and pressure loading for which the piping is presently designed without need for additional support or reinforcement and without reliance on any of the piping that is encased by the sleeve. Both Type B sleeves are welded to the pipe at each end to restore or maintain pressure integrity.

General Requirements

The Code Case invokes the design requirements of the ASME Code, Section III. The request stated that if an edition of Section III, other than the construction code is applied, it will be reconciled with the construction code in accordance with the ASME Code, Section XI requirements and it will have been accepted in 10 CFR 50.55a. The licensee request further stated that edition of the ASME Code, Section XI, identified in the table in Section 3.2 of this safety evaluation will apply to the repairs.

The Code Case requires that the cause of the degradation be determined and that the extent and rate of degradation in the subject piping be evaluated to ensure that there are no other unacceptable locations within the surrounding area that could affect the integrity of the repaired piping.

Code Case N-786-3 imposes various compensatory measures to account for any uncertainties in the corrosion rates used for design. The Code Case requires that the initial degradation rate selected for the design shall be equal to or greater than two times the maximum corrosion rate observed at the degraded pipe location. If the degradation rate for that degraded pipe location is unknown, an initial degradation rate of four times the estimated maximum degradation rate for that of a similar piping system at the same plant site for the same degradation mechanism shall be applied. If both the degradation rate for that degraded pipe location and the cause of the degradation are not conclusively determined, an initial degradation rate of four times the maximum degradation rate observed for all degradation mechanisms for that piping system or a similar piping system at the same plant site shall be applied.

Where sleeves are applied to the outside of piping to mitigate externally corroded areas with potential for bulging under pressure, the Code Case requires the corrosion cavity to be restored to the original contour of the pipe with hardenable fill to minimize the gap beneath the sleeve. The request stated that paragraph 1(f) of the originally published Code Case erroneously indicates that sleeves may not be attached to flanges; however, this has been corrected by the errata to the Code Case. Where sleeves are applied adjacent to weld neck flanges, the attachment weld will be extended to the neck of the flange.

The request stated that if a buried piping system carrying radioactive fluid is repaired using this alternative, the pipe will be monitor for radioactive fluid leakage in accordance with the standard plant monitoring practices for all buried piping containing radioactive fluids. The licensee stated that it is committed to implementing Nuclear Energy Institute (NEI) 07-07, “Industry Ground Water Protection Initiative – Final Guidance Document,” (dated August 2007), in addition to monitoring in accordance with Code Case N-786-3.

Temporary Sleeves

Code Case N-786-3 limits the design life of Type A and partial-structural Type B sleeves to a maximum of one operating cycle and requires that they be visually monitored for evidence of leakage at least monthly.

Code Case N-786-3 requires that Type A and partial-structural Type B reinforcing sleeves completely encompass the degraded areas, are designed to accommodate predicted maximum degradation, and must be removed no later than the next refueling outage regardless of when during an operating cycle or inspection interval they were installed. The licensee stated that if areas containing such sleeves are not accessible for direct observation, it will visually assess

surrounding areas or ground surface areas above such sleeves on buried piping, or monitoring of leakage collection systems, if available.

Permanent Sleeves

For the full-structural Type B sleeve, the Code Case requires a baseline thickness examination be performed on the attachment welds and surrounding areas, followed by similar thickness monitoring at a minimum of every refueling outage after installation. The Code Case requires more frequent thickness monitoring inspections to be scheduled when warranted by the degradation rates calculated using reductions in thicknesses observed during these inservice inspections (ISI), such that the required design thicknesses will be maintained at least until the subsequently scheduled thickness monitoring inspection.

Code Case N-786-3 requires that sleeves be removed prior to the degradation infringing upon the design minimum wall thickness. For the full-structural Type B sleeve on buried piping, provisions must be made for access during refueling outages in order to accomplish the required inspections.

The licensee stated that it will monitor thickness of any degraded pipe area of full-structural Type B reinforcing sleeves as part of its repair. The area of evaluation will be dependent on the degradation mechanism present but will extend at least $0.75\sqrt{Rt_{nom}}$ (where "R" and "t_{nom}" are the radius and nominal thickness of the pipe, respectively) beyond the edge of any sleeve attachment weld (at both ends of the sleeve), as required by the Code Case.

Code Case N-786-3 permits Type B sleeves to be applied to leaking piping by installing a gasket or sealant between the sleeve and the pipe and then clamping the sleeve halves to the piping prior to welding. The Code Case requires that any residual moisture be removed by heating prior to welding. If welding of any type of sleeve occurs on a wet surface, the maximum permitted life of the sleeve will be the time until the next refueling outage.

Section 8(f) of the Code Case specifies that if the cause of the degradation is not determined, the maximum permitted service life of any reinforcing sleeve will be the time until the next refueling outage.

3.6 Duration of Proposed Alternative

The February 14, 2020, letter, clarified that the requested duration approval for the relief requests RR-013, 1-RR-5-11, and 2-RR-5-11, is to permit installation of the repairs during the duration of the fifth ISI interval at MNGP and PINGP, Units 1 and 2, or until the NRC approves ASME Code Case N-786-3 in Regulatory Guide 1.147, whichever occurs first.

4.0 NRC STAFF EVALUATION

The NRC staff notes that Code Case N-786-3 has a discrepancy which is also identified in the proposed alternatives. Paragraph 1(f) of the Code Case specifies that the sleeve may not be applied to certain piping components such as flanges and flanged joints. However, Section 3.4 of the Code Case permits the use of sleeve on flanges and flanged joints. The ASME Code published an erratum in Supplement 6 of the 2017 Edition of the ASME Nuclear Code Case Book to revise paragraph 1(f) to permit the sleeve repair on flanges and flanged joints. The NRC staff finds acceptable for the sleeve to be installed on the flanges and flanged joints because the Code Case specifies provisions such that welding a sleeve on the flange or flanged

joint will not affect their structural integrity. The NRC staff further finds that limitations of applicability as shown in the Code Case will ensure that the sleeve will be installed on the appropriate pipe base metal.

The NRC staff evaluated the following requirements in proposed alternatives based on the key provisions of Code Case N-786-3. Below is a summary of the key, but not all, provisions of the proposed alternatives. The staff notes that the licensee needs to follow all the provisions in the Code Case and any additional requirements as discussed in the proposed alternatives. The NRC staff will discuss: (1) the general requirements for all three types of sleeves, and (2) specific requirements for each type of sleeves.

4.1 <u>General Requirements for Both Temporary and Permanent Sleeve Repairs</u>

Initial Evaluation

Code Case N-786-3 requires the repair be performed in accordance with the ASME Code, Section XI, IWA-4000, IWA-4150, and Construction Code.

Prior to sleeve installation, the Code Case requires the wall thickness of the degraded pipe area be measured to determine the length of the sleeve such that the sleeve is welded on or cover the sound region of the pipe. In addition, the cause and rate of degradation shall be determined and the extent of condition inspections shall be performed. The NRC staff finds the proposed initial evaluation acceptable because the licensee is required to assess the condition of the degraded pipe, determine the sleeve length, and perform extent of condition inspections.

Installation

The Code Case requires that the circumference of the pipe in the degraded location be cleaned to bare metal. The sleeve shall be fitted tightly around the pipe and hardenable fill material may be used in the annulus between the pipe and sleeve. Per the Code Case, the licensee will limit over-pressurization and intrusion of the hardenable fill into the pipe. The Code Case specifies that leakage and moisture be eliminated during welding. According to the Code Case, if welding is performed on a wet surface, the maximum permitted life of the reinforcing sleeve shall be the time until the next refueling outage.

The Code Case requires that weld metal be deposited using a groove welding procedure qualified in accordance with the ASME Code, Section IX, and the Construction Code. Fillet weld leg length shall be increased by the amount of fit-up gap. Sharp discontinuities that could cause stress risers at the toes of fillet welds or tapered edges of partial-penetration attachment welds shall be avoided. Venting during the final closure weld or pressure testing shall be available. The surfaces of all welds shall be prepared, if necessary, by machining or grinding to permit performance of surface and volumetric examinations. For ultrasonic examination, a surface finish of 250 RMS [root mean square] or better is required.

The NRC staff finds that the specified installation requirements will appropriately minimize fabrication defects, provide proper fit on the degraded pipe, and ensure an adequate surface finish for the examination.

The Code Case requires the shielded metal arc welding process with low hydrogen electrodes be used. The Code Case specifies precautions such as moisture removal be taken when welding the sleeve on wet exterior surfaces of the pipe. For piping materials other than P-No. 1

Group 1, the surface examination of welds shall be performed no sooner than 48 hours after completion of welding. The NRC staff finds the proposed repair has provided adequate requirements for welding on the wet surface and water in the pipe and, therefore, is acceptable.

Pressure Testing

The Code Case requires a system leakage test of the repaired pipe in accordance with ASME Code, Section XI, IWA-5000 prior to, or as part of, returning the system to service. In addition, the Code Case requires that Type B sleeves attached to piping that has not been breached shall be equipped with pressure taps for performance of pressure testing. The NRC staff finds the proposal acceptable because a system leakage test per IWA-5000 will be performed to determine any potential leakage after the sleeve is installed.

Examination

The Code Case specifies that final configuration of the attachment welds shall permit the examinations and evaluations, including any required preservice or inservice examinations of attachment or adjacent welds.

The Code Case requires all welds be examined using the liquid penetrant or magnetic particle method after sleeve is installed. The welds shall satisfy the surface examination acceptance criteria of the Construction Code or the ASME Code, Section III, NC-5300 (for ASME Code Class 2 systems) or ND-5300 (for ASME Code Class 3 systems). Except for tapered edges, the Code Case specifies that the thickness of attachment welds and the piping base metal upon which they are applied shall be measured ultrasonically to record baseline wall thickness. When volumetric examination is required, the full volume of the attachment weld, excluding the tapered edges but including the volume of base metal required for the service life of the reinforcing sleeve, shall be examined in accordance with the Construction Code or Section III using either the ultrasonic or radiographic method. The longitudinal seam welds in the sleeve shall be ultrasonically or radiographically examined, if required, in accordance with the Construction Code or the ASME Code, Section III. The volumetric examination results shall satisfy the acceptance criteria of the Construction Code or Section III, NC-5300 (for ASME Code Class 2 systems) or ND-5300 (for ASME Code Class 3 systems). Any volume of the piping beneath the sleeve that is credited in the design shall satisfy the acceptance criteria of NC-5320 and NC-5330 (for ASME Code Class 2 systems), or ND-5320 and ND-5330 (for ASME Code Class 3 systems).

The Code Case further specifies that if the weld design does not permit a joint efficiency of 0.8, Class 3 longitudinal seam welds may be examined using the surface examination method of the first layer, each 1/2-inch thickness of weld deposit, and final surface, in lieu of volumetric examination.

The NRC staff finds that the examination of the welds is acceptable because the welds are required to be either surface or volumetrically examined and the examination results are required to satisfy the acceptance criteria of the ASME Code, Section III.

Design

The Code Case requires that the sleeve be designed in accordance with the requirements of the ASME Code, Section III, NC-3100 and NC-3600 (for ASME Code Class 2 systems) or ND-3100 and ND-3600 (for ASME Code Class 3 systems), and Mandatory Appendix II. The sleeve shall

be made of ferritic steel and use compatible weld filler metal. The minimum width of the sleeve shall be 4 inches. The thickness of the sleeve shall be sufficient to maintain required thickness for the predicted life of the repair.

The Code Case further requires that the sleeve design consider: (1) all pipe loadings, (2) shrinkage effects on the piping, (3) stress concentrations caused by sleeve or resulting from piping surface configuration, (4) effects of welding on any interior coating, (5) differential thermal expansion between the sleeve, the attachment welds, and the pipe base metal, (6) loose debris in the pipe from continued degradation at the repaired pipe location, (7) longitudinal seam welds shall be full penetration, (8) the joint efficiency of the welds, and (9 fatigue evaluation and flexibility analysis.

The Code Case requires that the predicted maximum degradation of the pipe base metal and sleeve over the design life shall be based on in-situ inspection and established data for similar pipe base metals. The NRC staff finds that the sleeve design use at least two times the maximum corrosion rate observed at the degraded pipe location. The NRC staff notes that if the initial corrosion rate at the degraded location is unknown, the licensee will use a corrosion rate of four times the estimated maximum corrosion rate for that piping system or a similar piping system at the same plant site for the same degradation mechanism. The NRC staff recognizes that if the corrosion rate for both cases are unknown, the licensee will use a corrosion rate of four times the maximum degradation rate observed for all degradation mechanisms for that system or a similar system at the same plant site shall be applied. The NRC staff finds the margins used for the corrosion rates are consistent with generally accepted practice and are acceptable.

In addition, the Code Case requires that if the cause of the degradation is not determined, the maximum permitted service life of any reinforcing sleeve shall be the time until the end of the next refueling outage. The NRC staff finds this requirement acceptable because it is conservative to limit the service life of a pipe repaired by the full-structural Type B sleeve

4.2 Requirements for Temporary Sleeves

The Code Case requires that for the Type A sleeve, the ends of the sleeve shall be sealed, but not seal welded, in moist environments to prevent moisture intrusion and corrosion. The Type A sleeve may be used for structural reinforcement of thinned pipe areas which are not expected to penetrate the wall and cause leakage. The design life of a Type A sleeve is the time until the end of the next refueling outage.

The Code Case further requires that the partial-structural Type B sleeve be designed to accommodate design loadings at the pipe segment being reinforced, taking partial credit for the degraded segment after considering predicted degradation over the life of the repair. The licensee can consider partial credit in the sleeve design if the design relies on any portion of the pipe segment beneath the sleeve, other than the pipe base metal beneath the attachment welds, to provide structural or pressure integrity. The partial-structural Type B sleeve shall be designed to withstand the design pressure. The design life of a partial-structural Type B sleeve is the time until the end of the next refueling outage.

For a repair using the Type A sleeve or partial-structural Type B sleeve, the Code Case requires visual monitoring the repaired pipe for leakage at least monthly. If the repaired pipe is buried or not accessible for direct observation, surrounding areas or adjacent ground surface areas above the repaired location shall be visually assessed, or by monitoring of leakage collection systems,

if available. Repair using type A and partial-structural Type B sleeves is acceptable until the end of the next refueling outage. The NRC staff finds that the inservice examination for the Type A sleeve and partial-structural Type B sleeve is acceptable because for a temporary repair monthly visual monitoring is adequate.

4.3 Requirements for Permanent Sleeves

The Code Case specifies that the full-structural Type B sleeve is designed to accommodate pressure plus axial and circumferential design loadings at the repaired location without taking credit for any portion of the degraded pipe segment. The full-structural Type B sleeve shall be removed, and the piping repaired or replaced in accordance with the ASME Code, Section XI, IWA-4000, no later than the end of the design life of the repair.

The full-structural Type B sleeve shall be attached to the pipe by partial-penetration attachment welds, or complete joint penetration welds, extending for a distance of at least 'S' in each axial direction beyond the area predicted to infringe upon the required thickness, where $S \geq 0.75\sqrt{Rt_{nom}}$, where R is equal to the outer radius of the piping and t_{nom} is equal to the nominal wall thickness of the piping. The thickness of the partial-penetration attachment welds shall equal the thickness of the sleeve, and the outer edges of the attachment welds shall be tapered to the piping surface at a maximum angle of 45 degrees. The Code Case specifies that if the original Construction Code requires a flexibility analysis for the attachment welds, the licensee needs to use certain stress intensification factors in the flexibility analysis.

The Code Case requires preservice and inservice examination of full-structural Type B sleeve welds in accordance with the ASME Code, Section XI, IWC-2000 (for ASME Code Class 2 systems) or IWD-2000 (for ASME Code Class 3 systems). Specifically, the Code Case requires a base-line inspection of the full-structural Type B sleeve, its attachment welds, adjacent pipe base metal for an axial length of at least $0.75\sqrt{Rt_{nom}}$, and the surrounding areas showing signs of degradation, using ultrasonic or direct thickness measurement. The Code Case requires that the thickness monitoring inspections needs to be performed at least every refueling outage to verify that minimum design thickness per the Construction Code or the ASME Code, Section III, is not exceeded in the sleeve, at the attachment welds, or the underlying base metal. The Code Case requires more frequent thickness monitoring inspections if warranted. The licensee is required to have access to the full-structural Type B sleeve that is installed on buried piping to perform the periodic ISIs. The NRC staff determines that the requirements for the full-structural Type B sleeve are adequate in terms of design, installation, preservice examination, and inservice examination. Therefore, the NRC staff finds that the full-structural Type B sleeve is acceptable for use based on the proposed alternative.

4.4 Hardship Justification

The NRC staff finds that if the ASME Code repair had to be performed the subject plants would need to shut down. The mid-cycle shut down would cause unnecessary transients and loading on the plant systems and components. Requiring shut down and performance of an ASME Code repair will not increase the level of quality and safety as compared to the hardship the plants would experience.

4.5 Summary

The NRC staff finds that the design of the three types of sleeves will be based on the appropriate corrosion rate and pipe loads. The sleeve and weld design will follow the appropriate provisions of the ASME Code, Sections III and XI. Therefore, the NRC staff finds the design requirements are acceptable.

In addition to the Code Case, the licensee stated that if a buried pipe carrying radioactive fluid using this alternative, it will monitor for radioactive fluid leakage in accordance with the standard plant monitoring practices for all buried piping containing radioactive fluids based on NEI report 07-07, "Industry Ground Water Protection Initiative – Final Guidance Document," August 2007.

The NRC staff finds that the inservice examination will follow the ASME Code, Section XI. In addition, the licensee will inspect or monitor the sleeves with adequate frequency. Therefore, the NRC staff finds that the proposed inservice examination is acceptable.

5.0 CONCLUSION

The NRC staff determines that the proposed alternatives provide reasonable assurance of structural integrity of all ASME Code Class 2 and 3 moderate-energy carbon steel piping. The NRC staff finds that complying with the requirements of the ASME Code, Section XI, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC authorizes the use of relief requests RR-013 for MNGP, 1-RR-5-11 for PINGP, Unit 1, and 2-RR-5-11 for PINGP, Unit 2, for the fifth ISI intervals.

The NRC's approval of these three proposed alternatives does not imply or infer the NRC's approval of Code Case N-786-3 for the generic use.

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

Principal Contributor: John Tsao, NRR

Date: May 29, 2020