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**Licensee:** Xcel Energy
**Plant Unit(s) and Docket No(s):** Monticello (05000263)
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**Project Title:**
10 CFR 50.55a Request Associated with the Monticello Sixth Inservice Testing Ten-Year Interval VR-05 (L-MT-21-041)

**Proposed Alternative Number or Identifier:**
VR-05

**Request Type:**
10 CFR 50.55a(z)(1)

**Inservice Inspection (ISI) or Inservice Testing (IST)**
Inservice Testing (IST)

**Requested Completion Date:**
September 23, 2022

**Brief Description of Proposed Alternative**
Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), hereby requests NRC authorization of this 10 CFR 50.55a request to support the implementation of the Sixth IST Interval for Monticello Nuclear Generating Plant (MNGP). Proposed Alternative No. VR-05 requests authorization for an alternative to the conduct of pressure isolation valve testing each refueling outage and instead proposes to adopt a performance-based testing approach similar to that established under 10 CFR 50, Appendix J, 'Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,' Option B, 'Performance-Based Requirements.' Summary of Commitments: This submittal makes no new commitments and no revisions to existing commitments.

**Proposed Duration of Alternative (in terms of ISI/IST Program Interval with Start and End Dates):**
This request, upon approval, will be applied to the MNGP sixth 10-year IST interval starting October 1, 2022 and is scheduled to end May 31, 2032.

**Applicable ASME Code Requirements**
ISTC-3522, Category C Check Valves, states, in part, "Category C check valves shall be exercised as follows: (a) During operation at power, each check valve shall be exercised or examined in a manner that verifies obturator travel by using the methods in paragraph ISTC-5221… (c) If exercising is not practicable during operation at power and cold shutdown outages, it shall be performed during refueling outages." ISTC-3630, Leakage Rate for Other Than Containment Isolation Valves, states, in part, "Category A valves with a leakage requirement not based on an Owner 's 10 CFR 50, Appendix J program, shall be tested to

verify their seat leakages within acceptable limits. Valve closure before seat leakage testing shall be by using the valve operator with no additional closing force applied." ISTC-3630(a), Frequency, states, 'Tests shall be conducted at least once every 2 yr.'

**Applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPV Code), or ASME Operation and Maintenance of Nuclear Power Plants (OM Code), Edition and Addenda**

American Society of Mechanical Engineers (ASME) OM Code, Operation and Maintenance of Nuclear Power Plants, 2017 Edition with no Addenda.

**Current ISI or IST Program Interval Number and Start/End Dates**

MNGP is currently on its fifth 10-year IST interval that is scheduled to end on September 30, 2022. The MNGP sixth 10-year IST interval begins on October 1, 2022.

**Applicable ASME Code Components and/or System Description**

The following Residual Heat Removal (RHR) and Core Spray (CSP) Systems' pressure isolation valves (PIVs):

| Valve Identifier | Description | System | ASME Code Class | OM Cat. |
|---|---|---|---|---|
| MO-2014 | RHR Low Pressure Coolant Injection (LPCI) Inboard Isolation Valve | RHR | 1 | A |
| MO-2015 | RHR LPCI Inboard Isolation Valve | RHR | 1 | A |
| MO-1753 | 11 Core Spray (CS) System Motor Operated Inboard Injection Valve | CSP | 1 | A |
| MO-1754 | 12 Core Spray System Motor Operated Inboard Injection Valve | CSP | 1 | A |
| MO-2029 | Reactor Coolant to RHR Shutdown Cooling Supply Isolation Valve | RHR | 1 | A |
| MO-2030 | Reactor Coolant to RHR Shutdown Cooling Supply Isolation Valve | RHR | 1 | A |
| RHR-81 | Thermal Over-pressurization Relief Check Valve for Penetration X-12 | RHR | 1 | AC |
| AO-10-46A | RHR Injection Check Valve | RHR | 1 | AC |
| AO-10-46B | RHR Injection Check Valve | RHR | 1 | AC |
| AO-14-13A | 11 Core Spray Injection Air-Operated Check Valve | CSP | 1 | AC |
| AO-14-13B | 12 Core Spray Injection Air-Operated Check Valve | CSP | 1 | AC |

**Reason for Request**

Pursuant to 10 CFR 50.55a, Codes and standards, paragraph (z)(1), an alternative is proposed to the requirements of ASME OM Code paragraph ISTC-3522, "Category C Check Valves," and subparagraph ISTC-3630(a) under paragraph ISTC-3630, "Leakage Rate for Other Than Containment Isolation Valves," for the subject PIVs. Approval of this alternative will allow PIV testing to be performed at the Monticello Nuclear Generating Plant (MNGP) on a

performance-based frequency. The proposed 10 CFR 50.55a(z)(1) alternative provides for more efficient plant operation while maintaining an acceptable level of quality and safety.

Since PIVs may or may not be containment isolation valves, they are not necessarily included in scope for performance-based testing as provided in 10 CFR 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B, "Performance-Based Requirements." The concept behind the 10 CFR 50, Appendix J, Option B alternative for containment isolation valve testing is that licensees should be allowed to adopt cost-effective methods, including the setting of test intervals, for complying with regulatory requirements. Nuclear Energy Institute (NEI) 94-01, Industry Guideline for Implementing Performance Based Option of 10 CFR 50, Appendix J, Revision 3-A (Reference 1), describes a risk-informed basis for extending containment isolation valves test intervals under Option B. That justification shows that for containment isolation valves which have demonstrated good performance by successful completion of two consecutive leakage rate tests over two consecutive cycles, licensees may increase their test frequencies. Additionally, it states that if the component does not fail within two operating cycles, further failures appear to be governed by the random failure rate of the component. NEI 94-01 also presents the results of a comprehensive risk analysis, including the conclusion that "the risk impact associated with increasing [leak rate] test intervals is negligible (i.e., less than 0.1 percent of total risk)."

The valves identified in this request for an alternative are all in water applications. Testing is currently performed with water pressurized to at least 1000 psig.

This alternative is intended to provide for performance-based scheduling of PIV tests at the MNGP. One reason for requesting this alternative is to allow for divisional outages to reduce the required resources. Another reason is to reduce the dose accumulated through PIV testing consistent with NRC and industry As Low As Reasonably Achievable (ALARA) radiation dose principles. Review of historical data from the past four consecutive refueling outages identified that testing these PIVs each outage results in an average personnel dose of approximately 850 mrem. The proposed extended test intervals (assuming the PIVs are on extended frequency) would provide a savings of approximately 1.7 rem over three refueling outages.

NUREG-0933, Resolution of Generic Safety Issues, Issue 105, "Interfacing Systems LOCA at LWRs" (Reference 2), discusses the need for PIV leak-rate testing based primarily on three pre-1985 historical failures of applicable valves industrywide. These failures all involved human errors in either operations or maintenance. None of these failures involved inservice equipment degradation.

The performance of PIV leak-rate testing provides assurance of acceptable seat leakage with the valve in a closed position. For power-operated valves, testing consists of full-stroke exercise testing in accordance with the ASME OM Code to ensure their functional capabilities. For check valves, functional testing is accomplished in accordance with paragraph ISTC-3520, "Exercising Requirements," and paragraph ISTC-3522. For the affected check valves, the closed functional testing is credited to the PIV leak rate test. Performance of the separate two-year PIV leak rate testing provides assurance that the PIV check valves are capable of closing, but otherwise does not contribute any additional assurance of functional capability.

**Full Description of Proposed Alternative**

NSPM proposes pursuant to 10 CFR 50.55a, Codes and standards, paragraph (z)(1), the following alternative to the ASME OM Code requirements in ISTC-3522(a), ISTC-3522(c), and ISTC-3630(a). The specific test interval for each PIV would be a function of its performance and be established in a manner consistent with the containment isolation valve testing process under 10 CFR 50, Appendix J, Option B. Performance-based scheduling of PIV testing will be controlled in a manner similar to the methods described in NEI 94-01, Revision 3-A. PIV test performances would occur at a nominal frequency ranging from every refueling outage to every third refueling outage, subject to acceptable valve performance. Valves that have demonstrated good performance for two consecutive cycles may have their test interval extended up to 75 months, with a permissible extension (for non-routine emergent conditions) of nine months (84 months total).

A conservative control will be established such that if any valve fails the PIV test, the test interval will be reduced consistent with Appendix J, Option B, requirements. Any PIV leakage test failure would require the component to return to the initial interval of every 30 months until good performance can again be established.

**Description of Basis for Use**

The primary basis for this proposed alternative is the historically good performance of the PIVs. Attachment 1, "Leakage History of MNGP Pressure Isolation Valves," provides the leakage history for the subject PIVs for four consecutive refueling outage test performances with one exception. During the 2019 Refueling Outage (RFO), the Reactor Coolant to RHR Shutdown Cooling Supply Isolation Valves (MO-2029 and MO-2030) tested satisfactorily; however, the test results were lost. These two valves were tested again during the 2021 RFO (see Attachment 1).

The functional capability of the check valves is demonstrated by the open and close exercise test. The open testing is separate and distinct from the PIV testing and is currently performed at a refueling outage frequency, in accordance with OM Code paragraph ISTC-3522. The closed testing will take credit for the PIV leak rate testing and will be on the same frequency as the PIV leak rate testing. The fact that the PIVs exhibit good historical performance (no test results have exceeded the Required Action Limit) shows that the check valves are exhibiting the required obturator movement to close and remain closed.

Note that NEI 94-01, Revision 3-A, is not the sole basis for this request, given that NEI 94-01, Revision 3-A, does not address seat leakage testing with water. The NEI document is being cited as an approach similar to the requested alternative method. If the proposed alternative is authorized and the valves exhibit good performance, the PIV test frequency will be controlled similar to the method described in NEI 94-01, Revision 3-A, so that testing of these PIVs would not be required each refueling outage.

The extension of test frequencies proposed is consistent with the guidance provided in 10 CFR 50, Appendix J, Type C leak rate tests as detailed in NEI 94-01, Revision 3-A, Paragraph 10.2.3.2, "Extended Test Interval," which states:

"Test intervals for Type C valves may be increased based upon completion of two consecutive periodic as-found Type C tests where the result of each test is within a licensee's allowable administrative limits. Elapsed time between the first and last tests in a series of consecutive passing tests used to determine performance shall be 24 months or the nominal test interval (e.g., refueling cycle) for the valve prior to implementing Option B to Appendix J. Intervals for Type C testing may be increased to a specific value in a range of frequencies from 30

months up to a maximum of 75 months. Test intervals for Type C valves should be determined by a licensee in accordance with Section 11.0."

Additional bases for this proposed alternative are:

- Separate functional testing of motor-operated valve PIVs is performed in accordance with ASME OM Code, Mandatory Appendix III.

- The low likelihood of valve mispositioning during power operations (e.g., procedures and interlocks).

- Relief valves installed in the low-pressure piping – these relief valves may not provide Intersystem Loss of Coolant Accident (ISLOCA) mitigation for inadvertent PIV mispositioning but their relief capacity can accommodate conservative PIV seat leakage rates.

- Alarms that identify high-pressure to low-pressure leakage – Operators are highly trained to recognize symptoms of the presence of an ISLOCA and to take appropriate actions.

Following NRC approval of this proposed alternative, established leakage test intervals can be maintained as previously established based on performance. The leakage test intervals remain consistent with the process established under 10 CFR 50 Appendix J, Option B.

Extending the PIV leakage test interval based on good performance and low risk factor, as noted in NUREG/CR-5928, "ISLOCA Research Program Final Report," is a logical progression to a performance-based program, and provides an acceptable level of quality and safety pursuant to the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

**Describe Hardship or Unusual Difficulty**

Not Used.

**Any Additional Information (submission attachments listed here)**

1. 002_MNGP VR-05 WRR Attachment 1 R1.pdf

**Precedents**

1. This request was previously approved for the remainder of the fifth 10-year interval at MNGP, as documented in NRC safety evaluation dated July 15, 2020 (Reference 4) 2. LaSalle County Station, Units 1 and 2 – September 10, 2019 (Reference 5) 3. Limerick Generating Station, Units 1 and 2 – October 28, 2019 (Reference 6) 4. Peach Bottom Atomic Power Station, Units 2 and 3 – May 30, 2018 (Reference 7)

**References**

1. Nuclear Energy Institute (NEI) 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," Revision 3-A, dated July 2012

2. NRC NUREG-0933, "Resolution of Generic Safety Issues, Issue 105, Interfacing Systems LOCA at LWRs (Rev. 4) (NUREG-0933, Main Report with Supplements 1-34)"

3. NRC NUREG/CR-5928, “ISLOCA Research Program Final Report,” dated July 1993 (ADAMS Accession Number ML072430731)

4. NRC safety evaluation “Monticello Nuclear Generating Plant – Request for Alternative for Pressure Isolation Valve Testing (EPID L-2020-LLR-0006)” dated July 15, 2020 (ADAMS Accession Number ML20174A545)

5. LaSalle County Station, Units 1 and 2 – Request from the Requirements of the ASME Code Related to Pressure Isolation Valve Testing Frequency (EPID L-2019-LLR-0062), dated September 10, 2019 (ADAMS Accession Number ML19217A306)

6. Limerick Generating Station, Units 1 and 2 – Safety Evaluation of Relief Requests GVRR-8, 11-PRR-1, 90-PRR-1 and 47-VRR-2, Regarding the Fourth 10-year Interval of the lnservice Testing Program (EPID L-2018-LLR-0384, EPID L-2018-LLR-0385, EPID L-2018-LLR-0386, and EPID L-2018-LLR-0387), dated October 28, 2019 (ADAMS Accession Number ML19228A195)

7. Peach Bottom Atomic Power Station, Units 2 and 3 – Safety Evaluation of Relief Request GVRR-2 Regarding the Fifth 10-year Interval of the lnservice Testing Program (EPID No. L-2017-LLR-0094), dated May 30, 2018 (ADAMS Accession Number ML18141A600)