



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

July 12, 2023

Mr. Eric S. Carr
President – Nuclear Operations and
Chief Nuclear Officer
Dominion Energy Nuclear Connecticut, Inc.
Millstone Power Station
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 3 – ALTERNATIVE REQUEST FOR
PUMP PERIODIC VERIFICATION TESTING PROGRAM FOR CONTAINMENT
RECIRCULATION SPRAY SYSTEM PUMPS (EPID L-2022-LLR-0064)

Dear Mr. Carr:

By letter dated September 15, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22258A302), Dominion Energy Nuclear Connecticut, Inc. (licensee) submitted Alternative Request P-07 to the U.S. Nuclear Regulatory Commission (NRC) for authorization of an alternative to specific inservice testing (IST) requirements in the 2012 Edition of the American Society of Mechanical Engineers (ASME) *Operation and Maintenance of Nuclear Power Plants*, Division 1, OM Code: Section IST (OM Code) at Millstone Power Station, Unit No. 3 (Millstone 3), associated with the remainder of the Fourth 10-Year Interval IST Program, which is scheduled to end on December 1, 2028.

Specifically, pursuant to subparagraph (1) in paragraph (z), "Alternatives to codes and standards requirements," of Section 55a, "Codes and standards," in Part 50, "Domestic Licensing of Production and Utilization Facilities," to Title 10, of the *Code of Federal Regulations* (10 CFR 50.55a(z)(1)), the licensee requested in Alternative Request P-07 to implement an alternative pump periodic verification testing program for specified containment recirculation spray system pumps on the basis that performance of the proposed alternative would provide an acceptable level of quality and safety.

Accordingly, the NRC staff concludes that the licensee has adequately addressed the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC authorizes the use of proposed Alternative Request P-07 for the remainder fourth 10-year interval IST program at Millstone 3, which began on December 2, 2018, and is scheduled to end on December 1, 2028.

All other ASME OM Code requirements as incorporated by reference in 10 CFR 50.55a for which relief or an alternative was not specifically requested, and granted or authorized (as appropriate), in the subject request remain applicable.

E. Carr

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If you have any questions, please contact the Millstone project manager, Richard Guzman, at 301-415-1030 or by email to Richard.Guzman@nrc.gov.

Sincerely,

Hipólito J. González, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosure:
Safety Evaluation

cc: Listserv



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
ALTERNATIVE REQUEST P-07 FOR PUMP PERIODIC VERIFICATION TESTING PROGRAM
FOR CONTAINMENT RECIRCULATION SPRAY SYSTEM PUMPS
DOMINION ENERGY NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION, UNIT 3
DOCKET NO. 50-423
EPID L-2022-LLR-0064

1.0 INTRODUCTION

By letter dated September 15, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22258A302), Dominion Energy Nuclear Connecticut, Inc. (licensee) submitted Alternative Request P-07 to the U.S. Nuclear Regulatory Commission (NRC) for authorization of an alternative to specific inservice testing (IST) requirements in the 2012 Edition of the American Society of Mechanical Engineers (ASME) *Operation and Maintenance of Nuclear Power Plants*, Division 1, OM Code: Section IST (OM Code) at Millstone Power Station, Unit No. 3 (Millstone 3), associated with the remainder of the Fourth 10-Year Interval IST Program, which is scheduled to end on December 1, 2028.

Specifically, pursuant to subparagraph (1) in paragraph (z), "Alternatives to codes and standards requirements," of Section 55a, "Codes and standards," in Part 50, "Domestic Licensing of Production and Utilization Facilities," to Title 10 of the *Code of Federal Regulations* (10 CFR 50.55a(z)(1)), the licensee requested in Alternative Request P-07 to implement an alternative pump periodic verification testing program for specified containment recirculation spray system pumps on the basis that performance of the proposed alternative would provide an acceptable level of quality and safety. The NRC describes its review of Alternative Request P-07 for Millstone 3 in this safety evaluation.

2.0 REGULATORY EVALUATION

The NRC regulations in 10 CFR 50.55a(f)(4), "Inservice testing standards requirement for operating plants," state, in part, that throughout the service life of a boiling or pressurized water-cooled nuclear power facility, pumps and valves that are within the scope of the ASME

OM Code must meet the IST requirements (except design and access provisions) set forth in the ASME OM Code and addenda that become effective subsequent to editions and addenda specified in 10 CFR 50.55a(f)(2) and that are incorporated by reference in 10 CFR 50.55a(a)(1)(iv), to the extent practical within the limitations of design, geometry, and materials of construction of the components.

The NRC regulations in 10 CFR 50.55a(z) state, in part, that alternatives to the requirements of 10 CFR 50.55a(f) may be used, when authorized by the NRC, if the licensee demonstrates (1) the proposed alternatives would provide an acceptable level of quality and safety or (2) that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

3.0 TECHNICAL EVALUATION

The information provided by the licensee in support of Alternative Request P-07 has been evaluated and the bases for disposition are documented below.

3.1 Licensee's Alternative Request

Applicable Code Edition

The applicable ASME OM Code edition for the Millstone 3 Fourth 10-Year Interval IST Program is the 2012 Edition as incorporated by reference in 10 CFR 50.55a.

ASME Code Components Affected

Containment Recirculation Spray System (RSS) Pumps 3RSS*P1A, B, C and D (Group B, Class 2)

These pumps provide for containment structure depressurization during the recirculation mode for core heat removal. The pumps provide safety injection via the charging and safety injection pumps during recirculation.

Applicable Code Requirement

ASME OM Code (2012 Edition), Subsection ISTB, "Inservice Testing of Pumps in Light-Water Reactor Nuclear Power Plants – Pre-2000 Plants," paragraph ISTB-1400, "Owner's Responsibility," includes the following requirement in Part (d):

establishing a pump periodic verification [PPV] test program² in accordance with Division 1, Mandatory Appendix V.

Footnote 2 states: "Reference Division 1, Mandatory Appendix V, Pump Periodic Verification Test Program."

Mandatory Appendix V, "Pump Periodic Verification Test Program," establishes requirements for implementing a PPV test for applicable pumps with specific provisions. For example:

Mandatory Appendix V, Section V-3000, "General Requirements," states in paragraph (b):

perform the pump periodic verification test at least once every 2 yr [years]

Mandatory Appendix V, Section V-2000, "Definitions," defines the PPV test as follows:

a test that verifies a pump can meet the required (differential or discharge) pressure as applicable, at its highest design basis accident flow rate.

Licensee's Proposed Alternative

In lieu of the requirements of ASME OM Code, Mandatory Appendix V, Section V-2000, the licensee proposes an alternative PPV testing program for the Millstone 3 RSS pumps, as follows:

- All four RSS pumps shall be tested every 24 months, where two pumps in one train are tested at the highest design basis accident flow rate and the two pumps in the opposite train are tested at a reduced flow rate (using pump recirculation lines), and,
- The two pumps tested at reduced flow in a given 24-month interval shall be tested at the highest design basis accident flow in the subsequent 24-month interval.

As an example, RSS pumps 1A and 1C are tested at the design basis accident flow rate, and RSS pumps 1B and 1D are tested at the reduced flow rate (using pump recirculation lines) during interval "N." Then, RSS pumps 1B and 1D would be tested at the design basis accident flow rate, and RSS pumps 1A and 1C would be tested at the reduced flow rate during interval "N+1." Alternating the testing flow requirements for the trains during the subsequent 24-month intervals will ensure that all four RSS pumps are periodically tested at the design basis accident flow rate.

Licensee's Reason for Request

The NRC staff summarizes the licensee's reason for Alternative Request P-07 as follows:

The Millstone 3 RSS pumps are included in the PPV test program because all four pumps inject from the containment sump to the recirculation spray headers, for containment heat removal during a loss-of-coolant-accident (LOCA). To comply with the ASME OM Code and technical specification (TS) requirements, all four RSS pumps are currently tested each refueling outage (RFO). However, performing this testing during RFO shutdown modes can present challenges due to the RSS and Residual Heat Removal (RHR) System shared piping configuration. The Millstone 3 General Operating Procedure for Conducting Outages requires maintaining at least one protected train of plant safety-related components throughout the outage. One RHR pump is specifically required to be available during Modes 5 and 6 due to the system's decay heat removal function, which influences the sequencing of the RSS pump testing. This testing is also a competing priority with work on the RHR trains and/or the support systems (such as component cooling water, service water, and electrical buses) in Modes 5 and 6 or when the unit is defueled (Mode 0). The proposed alternative would support elimination of a safety train swap in the timeframe between the two reduced reactor coolant system (RCS) inventory

windows (i.e., before fuel offload and after fuel onload) during a Millstone 3 RFO. This would allow one train of the RHR system to remain dedicated for decay heat removal during this timeframe. The proposed alternative testing program would be beneficial for RFO planning and improve RHR availability, while continuing to provide adequate indication of RSS pump performance.

Basis for Use

The NRC staff summarizes the licensee's basis for use of Alternative Request P-07 as follows:

Operating any of the four RSS pumps in the recirculation mode does not require aligning a return flow path to the refueling water storage tank through RHR piping, and therefore does not affect RHR pump availability. A minimum flow rate of approximately 950 gallons per minute (gpm) for RSS pumps P1A and P1B, and 1950 gpm for RSS pumps P1C and P1D can be achieved using the pump recirculation lines. This equates to approximately 45 percent of the design basis accident flow rate for RSS pumps P1A and P1B, and approximately 90 percent of the design basis accident flow rate for RSS pumps P1C and P1D. These flow rates are sufficient to accommodate flow adjustment and maintain stable test flow conditions. Acceptable vibration levels will also be verified under the proposed alternative testing program to satisfy Millstone 3 RSS pump comprehensive testing requirements per the ASME OM Code.

The RSS pump performance curves exhibit a relatively constant slope from no flow to design flow conditions. Testing at recirculation flow rates will detect pump degradation because the pump curve is well sloped at this point on the curve. Also, the expected wear would be limited because the RSS pumps at Millstone 3 are typically only operated for testing purposes. The licensee provided pump flow test curves demonstrating the total developed head versus capacity for each RSS pump in its submittal.

Testing over the last five RFOs has shown consistent performance for the four pumps at Millstone 3. There have been no signs of mechanical or hydraulic degradation, even when compared to the original vendor shop testing data.

If maintenance is performed on any of the RSS pumps at Millstone 3 while the proposed alternative is in effect, the licensee will evaluate retesting requirements per the provisions of ASME OM Code. If required, a preservice test will be performed in accordance with the ASME OM Code. At least one of the five required measurements for the preservice test will be taken at a flow rate that exceeds the design basis accident flow rate. If a preservice test is not required, either a Group A or comprehensive test run will be performed at reduced flow rate (using the pump recirculation lines) or greater to assess whether the pump is operable.

In addition to the requirements of ASME OM Code, the RSS pumps are included in the Millstone 3 Predictive Maintenance Program. This program currently employs predictive monitoring techniques such as:

- Vibration spectrum analysis,
- Monitoring of motor electrical parameters,
- Periodic mechanical seal replacement, and
- Periodic motor oil replacement (the motors are the only pump components with oil lubricated bearings).

Preventive maintenance and performance monitoring efforts to date have been effective in maintaining RSS pump performance at Millstone 3.

The review of past work orders for the RSS pumps at Millstone 3 over the last 10 years did not identify any corrective repairs other than regular maintenance and minor oil leaks.

3.2 NRC Staff Evaluation

The ASME OM Code (2012 Edition), Subsection ISTB, paragraph ISTB-1400(d), requires the licensee to establish a PPV test program in accordance with Mandatory Appendix V. Paragraph (b) in Section V-3000 of Appendix V requires that a PPV test be conducted for each pump within the scope of Mandatory Appendix V at least once every 2 years. In Alternative Request P-07, the licensee requests to implement an alternative testing plan for the applicable RSS pumps at Millstone 3.

In Alternative Request P-07, the licensee proposes that all four RSS pumps at Millstone 3 shall be tested every 24 months, where two pumps in one train are tested at the highest design basis accident flow rate, and the two pumps in the opposite train are tested at a reduced flow rate using the pump recirculation lines. Per Alternative Request P-07, the two RSS pumps tested at reduced flow in a given 24-month interval shall be tested at the highest design basis accident flow at the subsequent 24-month interval. Alternating the testing flow requirements for the RSS pump trains during the 24-month intervals will ensure that all four RSS pumps are periodically tested at the design basis accident flow rate.

As indicated in the pump flow curves provided by the licensee, the RSS pumps exhibit performance with a relatively constant slope from no flow to design flow conditions. As a result, testing of the pumps at recirculation flow rates should be able to detect pump performance degradation. Also, pump wear should be limited because the RSS pumps are typically only operated for testing purposes and to perform their safety function if needed. Further, the licensee reported that testing of the RSS pumps over the last five RFOs has shown their consistent performance with no mechanical or hydraulic degradation. If maintenance is performed on the RSS pumps, the licensee will conduct retesting as necessary in accordance with the requirements of ASME OM Code. In addition, the RSS pumps are included in the Millstone 3 Predictive Maintenance Program with several periodic monitoring and preventive maintenance activities.

Based on the information provided by the licensee in Alternative Request P-07, the NRC staff finds that the licensee's request to implement an alternative PPV testing program for the applicable RSS pumps at Millstone 3 will provide reasonable assurance of the operational readiness of the pumps to perform their safety functions in lieu of the requirement in the ASME OM Code, Mandatory Appendix V, to conduct a PPV test every 2 years of each RSS pump within the scope of Mandatory Appendix V. As a result, the staff finds that the proposed PPV testing program for the applicable RSS pumps at Millstone 3 in Alternative Request P-07 provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(z)(1).

4.0 CONCLUSION

Based on the described review, the NRC staff finds that the licensee has demonstrated that the proposed PPV testing program for the RSS pumps at Millstone 3 listed in Alternative Request P-07 provides an acceptable level of quality and safety in lieu of the specified requirements in the ASME OM Code, Mandatory Appendix V. The staff also finds that the

alternative PPV testing program will provide reasonable assurance of the operational readiness of the specified RSS pumps at Millstone 3 to perform their safety functions. As a result, the NRC staff concludes that the licensee's Alternative Request P-07 meets 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes Alternative Request P-07 for the remainder of the Fourth 10-Year Interval IST Program at Millstone 3, which began on December 1, 2018, and is scheduled to end on December 1, 2028.

All other ASME OM Code requirements as incorporated by reference in 10 CFR 50.55a for which relief or an alternative was not specifically requested, and granted or authorized (as appropriate), in the subject request remain applicable.

Principal Contributors: M. Breach
T. Scarbrough

Date: July 12, 2023

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