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

January 12, 2024

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 – ISSUANCE OF AMENDMENT NO. 288 RE: REVISION TO APPLICABILITY TERM FOR REACTOR COOLANT SYSTEM HEATUP AND COOLDOWN PRESSURE-TEMPERATURE LIMITATIONS FIGURES (EPID L-2023-LLA-0009)

Dear Eric Carr:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 288 to Renewed Facility Operating License No. NPF-49 for the Millstone Power Station, Unit No. 3 (MPS3). The amendment consists of changes to the technical specifications (TS) in response to your application dated January 13, 2023, as supplemented by letter dated August 30, 2023.

The amendment revises MPS3 TS 3.4.9.1, “Reactor Coolant System Pressure/Temperature Limits,” to reflect that to reflect that the existing pressure-temperature (P-T) limit curves for 32 effective full power years (EFPY) in Figures 3.4-2 and 3.4-3 of TS 3.4.9.1 are applicable up to 54 EFPY.

A copy of the related safety evaluation is also enclosed. The Commission's monthly *Federal Register* notice will include the Notice of Issuance.

Sincerely,

/RA/

Richard V. Guzman, Senior Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosures:
1. Amendment No. 288 to NPF-49
2. Safety Evaluation

cc: Listserv

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

DOMINION ENERGY NUCLEAR CONNECTICUT, INC., ET AL

DOCKET NO. 50-423

MILLSTONE POWER STATION, UNIT NO. 3

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 288
Renewed License No. NPF-49

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Dominion Energy Nuclear Connecticut, Inc. (DENC, the licensee), dated January 13, 2023, as supplemented by letter dated August 30, 2023, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations, and all applicable requirements have been satisfied.

2. Accordingly, paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-49 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 288 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto are hereby incorporated into the license. DENC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of issuance and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Michael L. Marshall

Digitally signed by Michael L. Marshall
Date: 2024.01.12 10:29:51 -05'00'

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

Attachment:
Changes to the Renewed Facility Operating License

Date of Issuance: January 12, 2024

ATTACHMENT TO LICENSE AMENDMENT NO. 288

MILLSTONE POWER STATION, UNIT NO. 3

RENEWED FACILITY OPERATING LICENSE NO. NPF-49

DOCKET NO. 50-423

Replace the following page of the Renewed Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove	Insert
4	4

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
3/4 4-34	3/4 4-34
3/4 4-35	3/4 4-35

(2) Technical Specifications

The Technical Specifications contained in Appendix A, revised through Amendment No. 288 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto are hereby incorporated into the license. DENC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) DENC shall not take any action that would cause Dominion Energy, Inc. or its parent companies to void, cancel, or diminish DENC's Commitment to have sufficient funds available to fund an extended plant shutdown as represented in the application for approval of the transfer of the licenses for MPS Unit No. 3.

(4) Immediately after the transfer of interests in MPS Unit No. 3 to DNC*, the amount in the decommissioning trust fund for MPS Unit No. 3 must, with respect to the interest in MPS Unit No. 3, that DNC* would then hold, be at a level no less than the formula amount under 10 CFR 50.75.

(5) The decommissioning trust agreement for MPS Unit No. 3 at the time the transfer of the unit to DNC* is effected and thereafter is subject to the following:

(a) The decommissioning trust agreement must be in a form acceptable to the NRC.

(b) With respect to the decommissioning trust fund, investments in the securities or other obligations of Dominion Energy, Inc. or its affiliates or subsidiaries, successors, or assigns are prohibited. Except for investments tied to market indexes or other non-nuclear-sector mutual funds, investments in any entity owning one or more nuclear power plants are prohibited.

(c) The decommissioning trust agreement for MPS Unit No. 3 must provide that no disbursements or payments from the trust, other than for ordinary administrative expenses, shall be made by the trustee until the trustee has first given the Director of the Office of Nuclear Reactor Regulation 30 days prior written notice of payment. The decommissioning trust agreement shall further contain a provision that no disbursements or payments from the trust shall be made if the trustee receives prior written notice of objection from the NRC.

(d) The decommissioning trust agreement must provide that the agreement cannot be amended in any material respect without 30 days prior written notification to the Director of the Office of Nuclear Reactor Regulation.

* On May 12, 2017, the name “Dominion Nuclear Connecticut, Inc.” changed to “Dominion Energy Nuclear Connecticut, Inc.”

Heatup Limitations for Fluence up to 2.72E+19 n/cm^2 (54 EFPY)

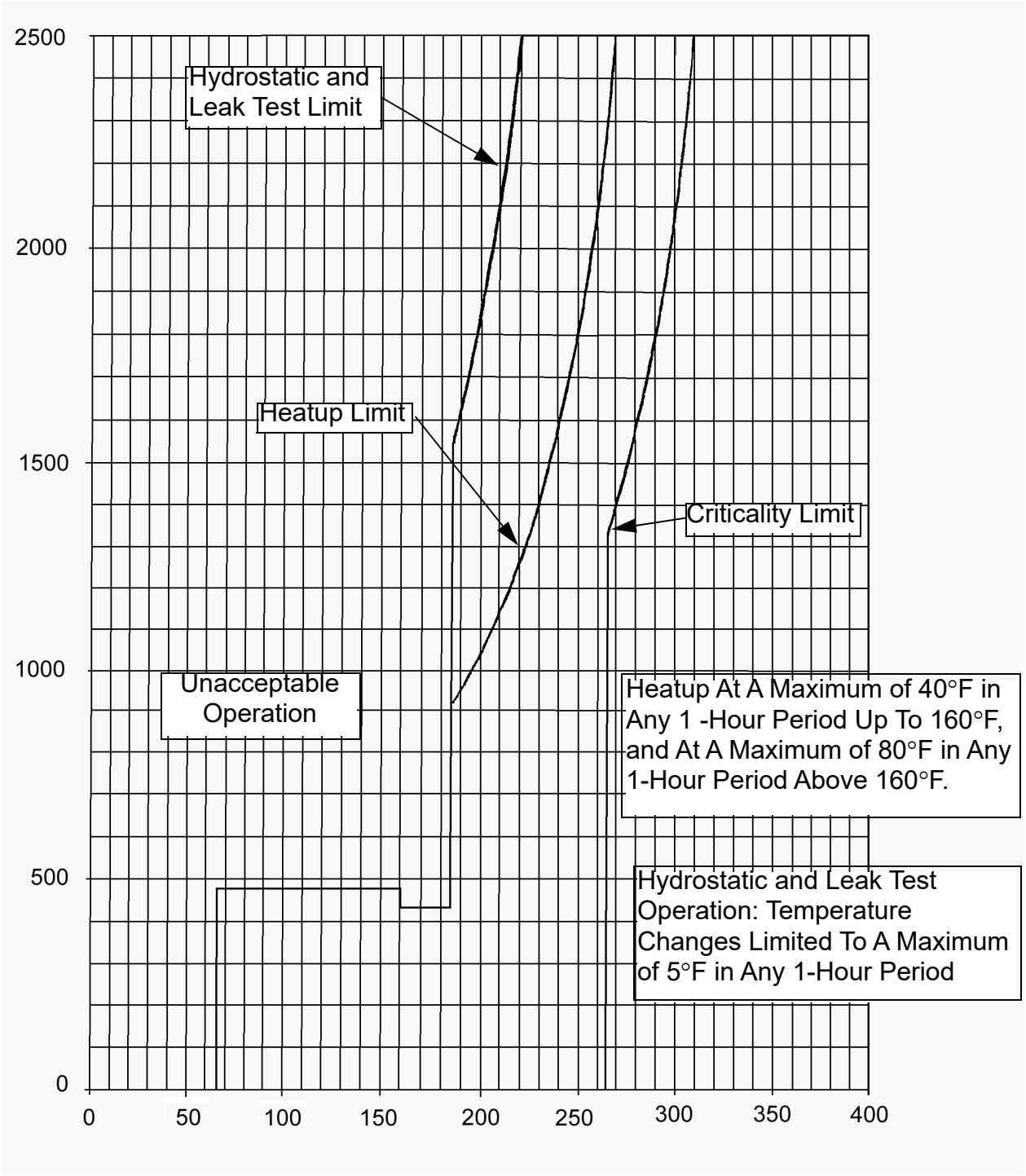

Figure 3.4-2

Cooldown Limitations for Fluence up to 2.72E+19 n/cm^2 (54 EFPY)

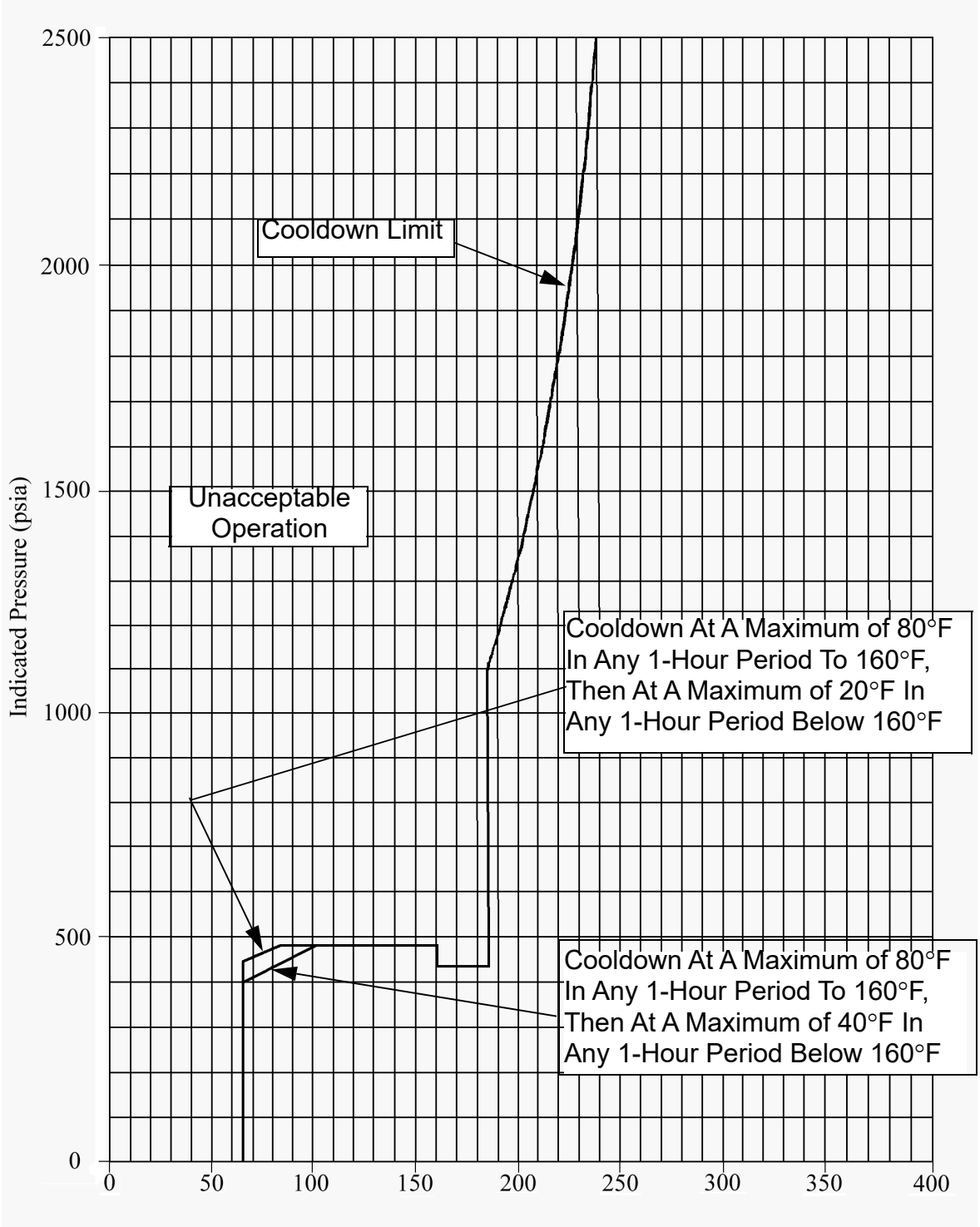

Figure 3.4-3

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 288

TO RENEWED FACILITY OPERATING LICENSE NO. NPF-49

DOMINION ENERGY NUCLEAR CONNECTICUT, INC., ET AL

MILLSTONE POWER STATION, UNIT NO. 3

DOCKET NO. 50-423

1.0 INTRODUCTION

By letter dated January 13, 2023 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML23013A224), as supplemented by letter dated August 30, 2023 (ML23248A213), Dominion Energy Nuclear Connecticut, Inc. (the licensee) submitted a license amendment request (LAR) to revise the technical specifications (TS) for Millstone Power Station, Unit 3 (MPS3).

The proposed changes would revise MPS3 TS 3.4.9.1, "Reactor Coolant System Pressure/Temperature Limits," to reflect that the existing pressure-temperature (P-T) limit curves for 32 effective full power years (EFPY) in Figures 3.4-2 and 3.4-3 of TS 3.4.9.1 are applicable up to 54 EFPY.

The supplement dated August 30, 2023, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC, the Commission) staff's original proposed determination that the amendment involves no significant hazards consideration, as published in the *Federal Register* on March 21, 2023 (88 FR 17035).

2.0 REGULATORY EVALUATION

The NRC established requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," to protect the integrity of the reactor coolant pressure boundary in nuclear power plants. The NRC staff evaluates the acceptability of a facility's proposed P-T limits based on the following NRC regulations and guidance.

2.1 Applicable Regulations

The regulations in 10 CFR 50.36, "Technical specifications," paragraph (a)(1), require that each operating license application for a production or utilization facility include proposed TSs and a summary statement of the bases for such specifications.

The regulations in 10 CFR 50.36(c) require, in part, that TSs include the following categories related to facility operation: (1) safety limits, limiting safety systems settings, and control settings; (2) limiting conditions for operation (LCO); (3) surveillance requirements; (4) design features; and (5) administrative controls.

The regulations in 10 CFR 50.60, "Acceptance criteria for fracture prevention measures for light-water nuclear power reactors for normal operation," require that all light-water nuclear power reactors meet the fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary set forth in 10 CFR Part 50, Appendices G, "Fracture Toughness Requirements," and H, "Reactor Vessel Material Surveillance Program Requirements."

The regulations in 10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock [PTS] events," requires, for pressurized water reactors, that the PTS reference temperature, RT_{PTS}, of the reactor vessel shell material be limited at the end of plant life to less than the PTS screening criterion of 270 degrees Fahrenheit (°F) for plates, forgings, and axial weld materials, and 300°F for circumferential weld materials.

The regulations in 10 CFR Part 50, Appendix G, establish fracture toughness requirements to maintain the integrity of the reactor coolant pressure boundary in nuclear power plants. P-T limit requirements for the reactor pressure vessel (RPV) are established in paragraph IV.A.2 and Table 1 of Appendix G. Paragraph IV.A.2 and Table 1 specify that P-T limit curves and minimum temperature requirements for the RPV are defined by the operating condition (i.e., pressure testing or normal operation, including anticipated operational occurrences), the RPV pressure, whether or not fuel is in the RPV, and whether the core is critical. In Table 1, the RPV pressure is defined as a percentage of the preservice system hydrostatic test pressure. The requirements for both the RPV P-T limit curves and the minimum RPV temperature must be met for all normal operating and pressure test conditions.

Additionally, 10 CFR Part 50, Appendix G, requires that applicable surveillance data from RPV material surveillance programs be incorporated into the calculations of the P-T limits and that the P-T limits be generated using a method that accounts for the effects of neutron irradiation on the material properties of the RPV beltline materials.

The regulations in 10 CFR Part 50, Appendix H, require a material surveillance program to monitor fracture toughness properties of ferritic materials in the reactor vessel beltline region which result from exposure of these materials to neutron irradiation and the thermal environment.

2.2 Applicable Guidance

Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," May 1988 (ML003740284), describes procedures acceptable to the NRC staff for calculating neutron radiation embrittlement of low-alloy steels used in light-water-cooled reactor vessels, including the adjusted reference temperature (ART) and adjusted nil-ductility transition reference temperature (RT_{NDT}).

Regulatory Issue Summary (RIS) 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components," dated October 14, 2014 (ML14149A165), provides guidance on the scope and detail of information that should be provided in RPV fracture toughness and associated licensing applications to

facilitate NRC staff review. The discussion includes P-T limits and P-T limit reports, and consideration of neutron fluence and structural discontinuities in the development of P-T curves.

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition" (SRP), Section 5.3.2, Revision 2, "Pressure-Temperature Limits, Upper-Shelf Energy, and Pressurized Thermal Shock," March 2007 (ML070380185), provides an acceptable method for determining the P-T curves based on 10 CFR Part 50, Appendix G, and the methodology of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Appendix G.

3.0 TECHNICAL EVALUATION

3.1 Background

Compliance with 10 CFR Part 50, Appendix G requires the use of the ASME Code, Section XI, Appendix G which specifies a procedure for calculating P-T limits that is based on linear elastic fracture mechanics. The critical material property used in the P-T limit calculation is the fracture toughness (K_{IC}). As specified in Paragraph G-2210 of the ASME Code, Section XI, K_{IC} is an exponential function of the difference in metal temperature at the postulated crack tip and the RT_{NDT} for the ferritic RPV material. Section IV.A of 10 CFR Part 50, Appendix G requires that the values of RT_{NDT} for RPV beltline materials used in the P-T limit calculations account for the effects of neutron irradiation and incorporate RPV surveillance material test data that are reported as part of the RPV materials surveillance program required by 10 CFR Part 50, Appendix H.

Neutron irradiation of RPV beltline materials will increase their RT_{NDT} values, thereby causing a rightward shift in the K_{IC} curve and a corresponding rightward shift (more restrictive) in the P-T limit curve. Given the shift of the P-T limit curve caused by neutron irradiation, the reactor coolant system is operated at lower pressures and/or higher temperatures (i.e., below and/or to the right of the curve) in order to maintain the required safety margins for protection of the RPV material against brittle fracture per 10 CFR Part 50, Appendix G.

The stress intensity factor (K_I) is a function of the stress state in the component and flaw configuration. The ASME Code, Section XI, Appendix G, requires a safety factor of 2.0 on the stress intensity factor resulting from the reactor pressure during normal and transient operating conditions, and a safety factor of 1.5 on the stress intensity factors for hydrostatic and pressure testing limits.

ASME Code, Section XI, Appendix G, specifies that the P-T limits be generated by postulating a flaw with a depth that is equal to 1/4 of the RPV shell thickness and a length equal to 1.5 times the RPV section thickness. The critical locations in the RPV shell thickness (T) for calculating P-T limit curves are the 1/4T and 3/4T locations, which correspond to the maximum depth of the postulated inside surface and outside surface defects, respectively.

The P-T limit curve calculations are based, in part, on the RT_{NDT} for the material, as specified in the ASME Code, Section XI, Appendix G. The RT_{NDT} is the critical parameter for determining the critical or reference stress intensity factor (fracture toughness, K_{IC}) for the material. As required by 10 CFR Part 50, Appendix G, RT_{NDT} values for materials in the RPV beltline region shall be adjusted to account for the effects of neutron irradiation.

Regulatory Guide (RG) 1.99, Revision 2, contains methodologies for calculating the ART due to neutron irradiation. The ART is defined as the sum of the initial (unirradiated) reference nil-ductility temperature (initial RT_{NDT}), the mean value of the shift in reference temperature caused by irradiation (ΔRT_{NDT}), and a margin term. The ΔRT_{NDT} is a product of a chemistry factor and a fluence factor. The chemistry factor is dependent upon the amount of copper (Cu) and nickel (Ni) in the material and may be determined from the tables in RG 1.99, Revision 2, or from surveillance data. The Cu and Ni values of the RPV shell material are obtained from vessel purchase order records, certified material test reports, or from values previously submitted to and approved by the NRC staff. The fluence factor is dependent upon the neutron fluence at the postulated flaw depths at the 1/4T and 3/4T locations. The margin term is dependent upon whether the initial RT_{NDT} is a plant-specific or a generic value and whether the chemistry factor was determined using the tables in RG 1.99, Revision 2, or surveillance data. The margin term is used to account for uncertainties in the values of the initial RT_{NDT}, the Cu and Ni contents, the neutron fluence and the calculational procedures.

The regulations of 10 CFR Part 50, Appendix G, require specific methods to determine neutron fluence to estimate the fracture toughness of the RPV materials. Appendix H to 10 CFR Part 50, requires the installation of surveillance capsules, including material test specimens and flux dosimeters, to monitor changes in fracture toughness.

3.2 NRC Staff Evaluation

The licensee's current P-T limit curves for 32 EFPYs were approved by the NRC in License Amendment No. 197 dated August 27, 2001 (ML012060343). By letter dated January 20, 2004 (ML040260070), the licensee submitted an application for renewal of the MPS3 operating license. The NRC issued a Renewed Facility Operating License for MPS3 by letter dated November 28, 2005 (ML053220382), which permits unit operation until November 25, 2045.

By letter dated November 19, 2020 (ML20324A703), the licensee submitted a measurement uncertainty recapture (MUR) power uprate, which increased the unit's authorized reactor core power level by approximately 1.6 percent rated thermal power, from 3650 megawatts thermal (MWt) to 3709 MWt. The MUR LAR contained a RPV integrity evaluation based on neutron fluence, PTS, ART, and upper-shelf energy (USE). By letter dated November 9, 2021 (ML21262A001), the NRC approved the MUR LAR as documented in License Amendment No. 280. The approved MUR LAR and the renewed license submittal contain information that is relevant to this LAR.

The NRC staff evaluated the subject request consistent with the requirements and guidance noted above. The following sections detail the staff's evaluation of the LAR in regard to ART, P-T Curves, PTS and USE.

3.3 Adjusted Reference Temperature

The existing P-T limit curves in MPS3 TS Figures 3.4-2 and 3.4-3 are applicable to 32 EFPY. The licensee proposed to use the same P-T limit curves up to 54 EFPY based primarily on updated ART calculations demonstrating that the current limiting ART is bounded by the previous 32 EFPY ART calculations. The key parameter in the P-T limit curve development is the ART value. The NRC staff focused on the comparison of the limiting ART value at 54 EFPY

and the limiting ART value used for the 32 EFPY P-T limit curves to determine whether the existing P-T limit curves are applicable to 54 EFPY.

As described in RIS 2014-11, the beltline definition in 10 CFR Part 50, Appendix G is applicable to all reactor vessel ferritic materials with projected neutron fluence values greater than 1.0×10^{17} n/cm^2 (neutron per square centimeter) (E > 1 MeV), and this fluence threshold remains applicable for the design life as well as throughout the licensed operating period.

The MPS3 beltline region consists of intermediate shell plates B9805-1, -2, -3; lower shell plates B9820-1, -2, -3; welds 101-124 A, B, C (as shown in Table 6 of Attachment 3 to the LAR); nozzle shell plate B9804; inlet nozzle B9806; nozzle shell welds; and inlet nozzle welds (as shown in Tables 10 and 11 of Attachment 2 to the licensee's supplemental letter dated August 30, 2023, also referred to as extended beltline materials).

The licensee calculated ART values for the beltline materials per RG 1.99, Revision 2, which depends upon the neutron fluence value and the chemistry factor. The chemistry factor is based on the chemistry content of the reactor vessel shell material. The licensee stated in Attachment 1 of the LAR that the projected maximum neutron fluence, in increasing from 32 to 54 EFPY, will increase from 1.97×10^{19} n/cm^2 to 2.72×10^{19} n/cm^2. This is projected for the inside surface of the RPV at the 30-degree azimuthal lower shell plate location.

Table 6 of Attachment 3 to the LAR provides the chemical composition of RPV intermediate shell plate B9805-1 which includes Cu and Ni contents of 0.052 and 0.637 weight percent (wt. %), respectively. RPV lower shell plate B9820-2 was reported to contain 0.065 wt. % Cu and 0.60 wt. % Ni.

The licensee stated in Attachment 3 to the LAR, Section 3.1, that the limiting ART for the 32 EFPY P-T limit curves is based on calculations for intermediate shell plate B9805-1 (plate heat number C4039-2) with ART values of 124.8°F and 107.0°F at the 1/4T and 3/4 T locations, respectively.

In Section 3.2 of Attachment 3 to the LAR, the licensee stated that per RG 1.99, Revision 2, Position 2.1, surveillance data from Capsule W was utilized in fitting of the capsule test data (Capsules U, X, and W) to adjust the chemistry factor of intermediate shell plate B-9805-1 from 31.0°F to 26.7°F. The NRC staff determined that the RPV material surveillance program at MPS3 satisfy the requirements of 10 CFR Part 50, Appendix H and that the chemistry factor for plate B-9805-1 was calculated correctly using Position 2.1 in RG 1.99, Revision 2.

In addition, when credible surveillance data are used, the margin term, σ_Δ, may be reduced per RG 1.99, Revision 2, Position 2.1. The capsule surveillance data and chemistry factor calculation for plate B-9805-1 are shown in Table 3 of Attachment 3 to the LAR. Using the revised chemistry factor and margin term, the licensee calculated the ART for intermediate shell plate B9805-1 to be 105.2°F at the 1/4T location for 54 EPPY as shown in Table 6 of Attachment 3 to the LAR. Therefore, with the revised chemistry factor for plate B9805-1, which had the highest inside radius ART (124.8°F) at 32 EFPY, the ART is revised to 105.2°F for the 1/4T location at 54 EFPY.

As shown in Table 6 of Attachment 3 to the LAR, the licensee calculated the limiting ART value of 118.7°F for lower shell plate B9820-2 at 54 EFPY. The NRC staff verified that the limiting ART value of the beltline region bounds the ART values of the beltline materials for 54 EFPY.

The NRC staff also verified that the limiting ART of 124.8°F for the 32 EFPY P-T limit curves bounds the limiting ART of 118.7°F for 54 EFPY.

The NRC staff noted that the limiting ART for welds 101-124, A, B, C (heat No 4P6052) is 21.9°F at the 1/4T location for 54 EFPY as shown in Table 6 of Attachment 3. The ART for the welds is sufficiently low as compared to the ART of plates B-9805 or B-9820 such that the ART for the welds will not affect the applicability of the 32 EFPY P-T limit curves.

Tables 10 and 11 of Attachment 2 to the licensee's supplemental letter dated August 30, 2023, presents the ART values for the extended beltline materials, including nozzle shell plate B9804, inlet nozzles B9806, nozzle shell welds, and inlet nozzle welds. The highest ART value for the extended beltline materials is 49.7°F which occurs at the 1/4T location of nozzle shell plate B9804-1 based on the projected neutron fluence at 54 EFPY. The NRC staff noted that 49.7°F is lower than the limiting ART value of 118.7°F for the lower shell plate B9820-2 of the beltline region. The NRC staff verified that the limiting ART value of the beltline region bounds the limiting ART value of the extended beltline materials. As such, the ART values of the extended beltline materials do not affect the applicability of the 32 EFPY P-T limit curves. The NRC staff confirmed that the licensee has considered the ART of all beltline materials in assessing the applicability of the existing 32 EFPY P-T limit curves and appropriately addressed the guidance of RIS 2014-11.

The NRC staff determined that the licensee has used the appropriate ART values of the limiting material to construct the proposed P-T limit curves for MPS3, such that irradiation embrittlement of the RPV material is appropriately accounted for in the P-T curves for 54 EFPY. The NRC staff verified that the ART values for RPV beltline materials in Attachment 3 to the LAR are appropriately calculated in accordance with RG 1.99, Revision 2, and are, therefore, acceptable.

3.4 P-T Curves

As noted above, the licensee's current P-T limit curves were approved by the NRC in License Amendment No. 197, dated August 27, 2001, and are applicable for a period of 32 EFPY.

The requirements of 10 CFR Part 50, Appendix G, specify that P-T limits be developed to bound all ferritic materials in the RPV. Further, the guidance in RIS 2014-11 states that P-T limit calculations for ferritic RPV materials, other than those materials with the highest reference temperature, may define P-T curves that are more limiting because the consideration of stress levels from structural discontinuities (such as RPV inlet and outlet nozzles) may produce a lower allowable pressure.

In Section 3.4 of Attachment 3 to the LAR, the licensee stated that the Pressurized Water Reactor (pressurized-water reactor) Owners Group (PWROG) issued the report, PWROG-15109-NP-A, Rev. 0, "PWR Pressure Vessel Nozzle Appendix G Evaluation," January 2020 (ML20024E573) to address the RPV nozzles in the beltline region for 10 CFR Part 50 Appendix G Evaluations. The PWROG report concludes that a plant-specific nozzle analysis is not required in the development of P-T limit curves if certain neutron fluence criteria are met. In light of that NRC-approved report, the licensee stated that the maximum neutron fluence at the MPS3 inlet and outlet nozzles is 1.29×10^{17} n/cm^2 for 54 EFPY as shown in Table 4 of Attachment 3 to the LAR. The criterion for non-evaluation in PWROG-15109-NP-A, Rev. 0 is a maximum surface neutron fluence of 4.28×10^{17} n/cm^2. Because the neutron fluence for the MPS3 beltline nozzles and welds is below 4.28×10^{17} n/cm^2, the licensee stated that these beltline materials require no further analysis as part of P-T limit curve calculations because they

are bounded by the results of PWROG-15109-NP-A, Rev. 0. The NRC staff verified that the neutron fluence values at 54 EFPY for all beltline nozzle locations on the MPS3 reactor vessel are less than 4.28 x 10^{17} n/cm^2 as shown in Table 4 of Attachment 3. Therefore, the NRC staff finds it acceptable that the nozzle analysis in the beltline regions was not included in the development of the P-T limit curves.

The NRC staff determined that the P-T limit curves for the 32 EFPY are applicable for 54 EFPY because the limiting ART value (124.8°F) used for the 32 EFPY P-T curves bounds the updated limiting ART value (118.7°F) for 54 EFPY such that irradiation embrittlement of the RPV material is appropriately accounted for in the P-T curves for 54 EFPY. The NRC staff verified that the ART values for RPV beltline materials are appropriately calculated in accordance with RG 1.99, Revision 2, and are, therefore, acceptable.

3.5 Pressurized Thermal Shock and Upper Shelf Energy

The LAR provided 54 EFPY projections of the RT_{PTS} and USE for specific materials. The regulation at 10 CFR 50.61 requires RT_{PTS} value of the reactor vessel shell materials at the end of the licensed period to be less than the screening criterion of 270°F for plates, forgings, and axial weld materials, and 300°F for circumferential weld materials. Table 8 of Attachment 3 to the LAR and Table 12 of Attachment 2 to the licensee's supplemental letter dated August 30, 2023, present the RT_{PTS} values of the MPS3 reactor vessel beltline materials. The bounding RT_{PTS} estimate for 54 EFPY was determined to be 124.1°F for the lower shell plate B9820-2. The NRC staff noted that the RT_{PTS} and USE values of the reactor vessel materials do not affect the P-T limit curves. The NRC staff also verified that the licensee appropriately derived the bounding RT_{PTS} based on the reactor vessel inside diameter neutron fluence of 2.72 x 10^{19} n/cm^2 and procedures of 10 CFR 50.61. The NRC staff confirmed that MPS3 reactor vessel shell materials continue to satisfy the above criterion of 10 CFR 50.61.

Compliance with 10 CFR Part 50, Appendix G requires a minimum USE of 50 ft-lbs, unless it is demonstrated in a manner approved by the NRC that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code. Attachment 4 to the LAR provides the projected USE for some beltline plates and welds at 54 EFPY. The NRC staff confirmed that the MPS3 RPV shell materials satisfy the minimum USE of 50 ft-lbs at 54 EFPY for the materials identified in Attachment 4, and are, therefore, acceptable.

3.6 Changes to Technical Specifications

The licensee's LAR proposes to modify TS LCO 3.4.9.1 by revising the figure title and x-axis for TS Figures 3.4-2 and 3.4-3 as follows (added text is shown below in bold and underlined, deleted text is shown in strikethrough):

- Figure 3.4-2, MILLSTONE 3 REACTOR COOLANT SYSTEM, Heatup Limitations for Fluence up to **2.72** ~~1.97~~E+19 n/cm^2 ~~(32 EFPY)~~ (**54 EFPY**).

- Figure 3.4-3, MILLSTONE 3 REACTOR COOLANT SYSTEM, Cooldown Limitations for Fluence up to **2.72** ~~1.97~~E+19 n/cm^2 ~~(32 EFPY)~~ (**54 EFPY**).

The LAR also proposed additional TS changes to correct typographical errors as follows:

- The administrative change corrects a typographical error from “cm” to “cm^2” to reflect the standard units for fluence.

- The proposed change corrects a typographical error to reflect the standard symbol for degrees Fahrenheit (°F) in the x-axis of TS Figures 3.4-2 and 3.4-3 as follows:

    - Indicated Cold Leg Temperature (~~x~~°F)

The NRC staff finds that corrections to the typographical errors are administrative in nature and do not affect the staff’s technical evaluation as documented in this safety evaluation, and therefore, the changes are acceptable.

MPS3 TS 3.4.9.1 Reactor Coolant System (RCS) Pressure/Temperature Limits states:

> Reactor Coolant System (except the pressurizer) temperature, pressure, and heatup and cooldown rates of ferritic materials shall be limited in accordance with the limits shown on Figures 3.4-2 and 3.4-3. In addition, a maximum of one reactor coolant pump can be in operation when the lowest unisolated Reactor Coolant System loop wide range cold leg temperature is ≤ 160°F.

The regulation at 10 CFR 50.36 states, “The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34.” The regulation also requires that when an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met.

In Section 3.4 of this safety evaluation, the NRC staff found that the licensee satisfactorily demonstrated that the current MPS3 P-T limit curves are applicable for the extended period of 54 EFPY, and further, the staff also concluded that the proposed changes to TS Figures 3.4-2 and 3.4-3 meet the requirements of Appendix G to 10 CFR Part 50, thus, extending the applicability date of the existing P-T limit curves is acceptable.

The NRC staff also finds that the proposed change will not impact the licensee’s continued compliance with regulatory requirements and guidance described in section 2.0 of this safety evaluation. The proposed changes revise the applicability term associated with the TS P-T limit curve figures while the P-T limit curves and limiting ART values remain unchanged. Based on the above, the NRC concludes the proposed changes continue to meet the requirements in 10 CFR 50.36, and are, therefore, acceptable.

3.5 Technical Conclusion

Based on the above, the NRC staff concludes that the 32 EPFY P-T limit curves in MPS3 TS Section 3.4.9.1, Figures 3.4-2 and 3.4-3 are acceptable at 54 EFPY because the P-T limit curves satisfy the requirements of the ASME Code, Section XI, Appendix G and 10 CFR Part 50, Appendices G and H based on updated information. The NRC staff further concludes that the RT_{PTS} and USE values of the RPV shell materials provided were calculated consistent with the requirements of 10 CFR 50.61 and 10 CFR 50, Appendix G, respectively.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Connecticut State official was notified of the proposed issuance of the amendment on December 7, 2023. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, published in the *Federal Register* on March 21, 2023 (88 FR 17035), and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: C. Fairbanks, NRR
J. Tsao, NRR
C. Moyer, NRR
R. Grover, NRR

Date of Issuance: January 12, 2024

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 3 – ISSUANCE OF AMENDMENT NO. 288 RE: REVISION TO APPLICABILITY TERM FOR REACTOR COOLANT SYSTEM HEATUP AND COOLDOWN PRESSURE-TEMPERATURE LIMITATIONS FIGURES (EPID L-2023-LLA-0009) DATED JANUARY 12, 2024

DISTRIBUTION:

PUBLIC
RidsACRS_MailCTR Resource
RidsNrrDorlLpl1 Resource
RidsNrrDnrlNvib Resource
RidsNrrDssStsb Resource
RidsNrrPMMillstone Resource
RidsNrrLAKEntz Resource
RidsRgn1MailCenter Resource
CNove, NRR
CFairbanks, NRR
JTsao, NRR
RGrover, NRR

ADAMS Accession No.: ML23341A017

OFFICE	NRR/DORL/LPL1/PM	NRR/DORL/LPL1/LA	NRR/DNRL/NVIB/BC(A)	NRR/DSS/STSB/BC(A)
NAME	RGuzman	KEntz	DWidrevitz	SMehta
DATE	12/7/2023	12/8/2023	12/1/2023	11/13/2023
OFFICE	OGC	NRR/DORL/LPL1/BC	NRR/DORL/LPL1/PM	
NAME	STurk	HGonzález (MMarshall for)	RGuzman	
DATE	01/08/2024	01/12/2024	01/12/2024	

OFFICIAL RECORD COPY