May 1, 2007

Mr. David A. Christian
Sr. Vice President and Chief Nuclear Officer
Dominion Nuclear Connecticut, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNIT NOS. 2 AND 3 — RELIEF REQUESTS NOS. RR-89-60 AND IR-2-44 REQUESTING FOR ALTERNATIVES TO THE 10-YEAR REACTOR VESSEL EXAMINATIONS REQUIREMENTS (TAC NOS. MD1719 AND MD1720)

Dear Mr. Christian:

By letter dated May 11, 2006, [Agency Documents Access and Management System (ADAMS) accession number ML061530137] Dominion Nuclear Connecticut, Inc. (DNC) submitted to the U.S. Nuclear Regulatory Commission (NRC), Relief Requests RR-89-60 and IR-2-44 for approval to use alternatives to the examination requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI at the Millstone Power Station, Unit Nos. 2 and 3. Specifically, DNC requests the use of Performance Demonstration Initiative (PDI) qualified procedures for the performance of the ultrasonic testing examination of the reactor pressure vessel shell-to-flange weld in accordance with ASME Code, Section XI, Division I,1995 Edition,1996 Addenda, Appendix VIII, Supplements 4 and 6. The relief is requested pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i).

Based upon the review of the information you provided, the NRC concluded that the proposed alternative provides reasonable assurance of satisfactory ultrasonic testing examination of the reactor pressure vessel shell-to-flange weld that are performed from the vessel side of the weld, and the NRC finds that the use PDI qualified procedures as an alternative provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), your proposed alternative is authorized. The NRC staff's Safety Evaluation is enclosed. If you have any questions, please contact the project manager, John Hughey at (301) 415-3204.

Sincerely,

/ra/
Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-336, 50-423
Enclosure: As stated
cc: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUESTS NOS. RR-89-60 AND IR-2-44

MILLSTONE POWER STATION, UNIT NOS. 2 AND 3

DOMINION NUCLEAR CONNECTICUT, INC.

DOCKET NUMBERS 50-336 AND 50-423

1.0 INTRODUCTION

By letter dated May 11, 2006, Dominion Nuclear Connecticut, Inc. (DNC) submitted to the U.S. Nuclear Regulatory Commission (NRC), a request for approval to use alternatives to the examination requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI at the Millstone Power Station, Unit Nos. 2 and 3 (MPS2 and MPS3). Specifically, DNC requests the use of Performance Demonstration Initiative (PDI) qualified procedures for the performance of the ultrasonic testing examination of the reactor pressure vessel shell-to-flange weld in accordance with ASME Code, Section XI, Division I,1995 Edition,1996 Addenda, Appendix VIII, Supplements 4 and 6. The relief is requested pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i).

2.0 REGULATORY EVALUATION

The inservice inspection (ISI) of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by NRC pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states in part that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for ISI of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and

modifications listed therein. The ISI Code of record for the third 10-year ISI interval for MPS2 and the second 10-year ISI interval for MPS3 is the 1989 Edition of the ASME Code, Section XI. In addition, 10 CFR 50.55a(g)(6)(ii)(C)(2) requires that licensees using the 1989 Edition or earlier editions must implement the 1995 Edition with the 1996 Addenda of Appendix VIII and the supplements to Appendix VIII of Section XI of the ASME Code.

3.0 EVALUATION FOR RELIEF REQUEST NOS. RR-89-60 AND IR-2-44

3.1 Components for Which Relief is Requested

ASME Code Class 1, Item B1.30, Reactor Pressure Vessel (RPV) Shell-to-Flange welds identified as:

Millstone 2:	Weld FS-1
Millstone 3:	Weld 101-121

3.2 Code Requirements

The 1989 Edition of ASME Code, Section XI, Appendix I, Subparagraph I-2110, requires that ultrasonic testing (UT) of RPV shell-to-flange welds be conducted in accordance with Article 4 of ASME Code, Section V, supplemented by the requirements of Table I-2000-1. In addition, Regulatory Guide (RG) 1.150, Revision 1, "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations," serves as guidance for UT examination of RPV welds.

3.3 Licensee's Proposed Alternative and Basis for Use

During the upcoming 10-year RPV vessel examinations, the licensee proposes to perform ultrasonic examinations of the RPV shell-to-flange welds using procedures, personnel, and equipment that have been demonstrated and qualified in accordance with ASME Section XI, 1995 Edition with 1996 Addenda, Appendix VIII, Supplements 4 and 6 as amended by 10 CFR 50.55a. The examination will be performed automated as qualified in accordance with ASME Code, Section XI, 1995 Edition with 1996 Addenda, Appendix VIII, Supplements 4 and 6 as amended by 10 CFR 50.55a and the PDI Program. Since the subject examinations will be performed from a single side due to the weld configuration, all procedures, personnel, and equipment will be qualified for single side access for examination of these welds.

Appendix VIII requirements were developed and adopted to ensure the effectiveness of ultrasonic examinations within the nuclear industry by means of a rigorous, item specific performance demonstration containing flaws of various sizes, locations, and orientations. The performance demonstration process has established with a high degree of confidence, the capability of personnel, procedures, and equipment to detect and characterize flaws that could be detrimental to the structural integrity of the RPV. The PDI approach has demonstrated that for detection and characterization of flaws in the RPV the ultrasonic examination techniques are equal to or surpass the requirements of the ASME Code, Section V, Article 4 ultrasonic examination requirements.

The licensee finds that though Appendix VIII is not required for the RPV shell-to-flange weld examination, the use of Appendix VIII, Supplements 4 and 6 criteria for detection and sizing of flaws in the subject welds will be equal to or exceed the requirements of ASME Code, Section V, Article 4 and the guidance in RG 1.150.

3.4 NRC Staff Evaluation

The ASME Code requires that ultrasonic examination of shell-to-flange welds in vessels greater than 2 inches in thickness be conducted in accordance with Article 4 of the ASME Code, Section V, as supplemented by requirements in Table I-2000-1. ASME Code, Section V, Article 4 provides a prescriptive process for qualifying UT procedures and performing examinations. The licensee instead proposes to use procedures and personnel qualified in accordance with performance-based criteria listed in the 1995 Edition, 1996 Addenda of the ASME Code, Section XI, Appendix VIII, Supplements 4 and 6 as implemented by the industry's PDI program. These performance-based methods are currently required by 10 CFR 50.55a for examination of all other RPV shell welds (having replaced the Article 4 techniques).

Amplitude-based sizing techniques such as the prescriptive UT procedures that comply with the requirements of Article 4 of ASME Code, Section V, are based on the amplitude of the returned signal and correlating that amplitude with an equivalent machined reflector such as a notch or a side-drilled hole. However, correlation between defect size and amplitude has been poor. This is not unexpected given the number of variables from the material, equipment and defect itself. The material has potential velocity and microstructure variations, and the equipment has potential amplitude variations due to the type of pulser, frequency band, cabling, and other inherent electrical parameters. Perhaps the biggest variable is the defect itself. Ultrasonic examination is highly sensitive to defect orientation. Also, transparency, roughness, curvature, and location play a role in the ability to detect and size defects. In addition, conventional amplitude-based ultrasonics is particularly unreliable for vertical defects.

When prescriptive UT procedures that comply with the requirements of Article 4 of ASME Code, Section V, were used in round robin tests containing real flaws in RPV mockups, and the results statistically analyzed according to the screening criteria of ASME Code, Section XI, Appendix VIII, the procedures proved to be less effective than examinations that utilize Appendix VIII, Supplements 4 and 6, qualified procedures. Performance-based UT is generally applied with higher sensitivity, which increases the probability of detecting a flaw when compared to prescriptive Section V, Article 4 requirements. Also, flaw sizing is more accurately determined with the time-based tip diffraction criteria used by performance-based ultrasonics than with the less accurate amplitude criteria for prescriptive Section V, Article 4 requirement. Procedures, equipment, and personnel qualified through the PDI program have demonstrated their skill level to detect flaws common to nuclear power plants and have shown high probability of detection levels. This has resulted in an increased reliability of inspections for weld configurations subject to the requirements of Appendix VIII.

The licensee states that the examination, using automated equipment, will be performed by procedures qualified in accordance with ASME Code, Section XI, 1995 Edition with 1996 Addenda, Appendix VIII, Supplements 4 and 6 as amended by 10 CFR 50.55a and the PDI program. Due to the weld configuration the examination will be performed from a single side. Therefore, all procedures, personnel, and equipment will be qualified for single-sided access for examination of the subject welds.

3.5 Summary

The NRC staff finds that the use of UT procedures and personnel qualified to the 1995 Edition with 1996 Addenda of Section XI of the ASME Code, Appendix VIII, Supplement 4 and 6, as modified by 10 CFR 50.55a by demonstration through the PDI program for the RPV shell-to-flange weld, provides equivalent or better examination results than those obtained from ASME Code, Section V requirements and RG 1.150 recommendations. Therefore, based on the above analysis, the staff considers that an acceptable level of quality and safety will be maintained when using the licensee's proposed alternative examination.

4.0 CONCLUSION

The NRC staff concludes that the proposed alternative with PDI qualified procedures and personnel applied from the RPV shell surface along with the improved capabilities as discussed above will provide equivalent or better examination results than those realized from the ASME Code, Section V, requirements and RG 1.150 recommendations and, therefore, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC authorizes the proposed alternative for the remainder of the third 10-year ISI interval at MPS2 and the second 10-year ISI interval at MPS3.

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

Principal Contributor: A. Keim

Date: May 1, 2007