



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

June 11, 2010

Mr. David A. Heacock
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 NO. 3 – ISSUANCE OF RELIEF
REQUEST IR-3-05 REGARDING USE OF AMERICAN SOCIETY OF
MECHANICAL ENGINEERING CODE, SECTION XI, APPENDIX VIII
(TAC NO. ME1257)

Dear Mr. Heacock:

By letter dated April 28, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML091310666), Dominion Nuclear Connecticut, Inc. (DNC or the licensee), submitted relief requests for the third 10-year inservice inspection (ISI) interval program at Millstone Power Station, Unit No. 3 (MPS3). DNC requested the use of an alternative to certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI requirements. Included in this request was Relief Request IR-3-10. By letters dated January 14, 2010, and May 6, 2010 (ADAMS Accession Nos. ML100190513 and ML101310006, respectively), DNC supplemented Relief Request IR-3-05. DNC submitted Revision 1 to Relief Request IR-3-05 in the January 14, 2010, letter. Relief Request IR-3-05, Revision 1, superseded IR-3-05 in its entirety. Relief Request IR-3-05, Revision 1, pertains to the ISI of Alloy 82/182 dissimilar metal piping welds and adjacent similar metal welds which have had a full structural weld overlay applied at MPS3. The other relief requests contained in the April 28, 2009, request have been reviewed separately.

The Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the proposed ISI of Alloy 82/182 dissimilar metal piping welds and adjacent similar metal welds which have had a full structural weld overlay applied at MPS3 provides an acceptable level of quality and safety.

Therefore, pursuant to Title 10 of the *Code of Federal Regulations*, Part 50, Section 50.55a(a)(3)(i), the NRC authorizes the use of RR-3-05, Revision 1, for ISI of weld overlays on Weld Nos. 03-X-5551-X-T, 03-X-5641-E-T, 03-X-5644-A-T, 03-X-5648-B-T, 03-X-5649-C-T, and 03-X-5650-D-T for the third 10-year interval at MPS3. The third 10-year ISI interval began on April 23, 2009, and is scheduled to be completed on April 22, 2019.

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

D. Heacock

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If you have any questions, please contact the Project Manager, Carleen Sanders, at 301-415-1603.

Sincerely,

A handwritten signature in black ink, appearing to read "Harold K. Chernoff". The signature is fluid and cursive, with the first name "Harold" being the most prominent.

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

Docket No. 50-423

Enclosure:
As stated

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

REQUEST FOR RELIEF NO. IR-3-05

MILLSTONE POWER STATION, UNIT NO. 3

DOMINION NUCLEAR CONNECTICUT, INC.

DOCKET NUMBER 50-423

1.0 INTRODUCTION

By letter dated April 28, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML091310666), Dominion Nuclear Connecticut, Inc. (DNC or the licensee), submitted relief requests for the third 10-year inservice inspection (ISI) interval program at Millstone Power Station, Unit No. 3 (MPS3). DNC requested the use of an alternative to certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI requirements. Included in this request was Relief Request IR-3-10. By letters dated January 14, 2010, and May 6, 2010 (ADAMS Accession Nos. ML100190513 and ML101310006, respectively), DNC supplemented Relief Request IR-3-05. DNC submitted Revision 1 to Relief Request IR-3-05 in the January 14, 2010, letter. Relief Request IR-3-05, Revision 1, superseded IR-3-05 in its entirety. Relief Request IR-3-05, Revision 1, pertains to the ISI of Alloy 82/182 dissimilar metal piping welds and adjacent similar metal welds which have had a full structural weld overlay applied at MPS3.

The application of the weld overlays at MPS3 were one time Relief Requests, IR-2-39 and IR-2-47, in the second interval based on the guidance of Code Case N-504-2 for Relief Request IR-2-39 and Code Case N-740 for Relief Request IR-2-47. For the third interval, the subsequent examination of the weld overlays needs to be considered. The licensee proposes to combine the examination criteria for the weld overlays identified in Relief Requests IR-2-39 and IR-2-47 into one set of examination criteria as described in Section 3.4 below.

The alternative requirements proposed by the licensee in this request are derived from those in Code Case N-770, "Alternate Examination Requirements and Acceptance Standards for Class 1 PWR [Pressurized Water Reactor] Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," which was approved by ASME on January 26, 2009. Only those requirements pertinent to the ISI of full structural weld overlays were used by the licensee

Enclosure

in this request. The Nuclear Regulatory Commission (NRC) has not endorsed Code Case N-770 at this time.

The request was submitted for the third 10-year ISI interval which began on April 23, 2009, and ends on April 22, 2019.

2.0 REGULATORY REQUIREMENTS

The ISI of the ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Code and applicable addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states 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 Inservice Inspection 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) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ASME Code of Record for the MPS3 third 10-year ISI interval is the 2004 Edition with no Addenda of Section XI of the ASME Code.

3.0 TECHNICAL EVALUATION

3.1 Applicable Code Edition and Addenda

The Code of Record for the third 10-year ISI program at MPS3 is the 2004 Edition of the ASME Code, Section XI. The third 10-year ISI interval for MPS3 began on April 23, 2009, and is scheduled to end on April 22, 2019.

3.2 Components for Which Relief is Requested (as stated in IR-3-05, Revision 1)

ASME Code Class: Code Class 1

References: WCAP-14572, Revision I-NP-A,
Second Interval Relief Requests IR-2-39 and IR-2-47

Examination Category: R-A

Item Numbers: R1.11 (Safe End-to-Pipe Welds)
R1.20 (Nozzle-to-Safe End Welds)

Description: Examination of Weld Overlays

Components: Dissimilar Metal Piping Welds with Alloy 82/182 Weld Metal and Adjacent Welds which have had a Full Structural Weld Overlay Applied. See Below for List of Welds.

1. Weld No. 03-X-5551-X-T: Weld overlay encapsulating pressurizer surge nozzle-to-safe end dissimilar metal weld and the adjacent safe end-to-pipe weld (Weld No. RCS-SL-FW-4).
2. Weld No. 03-X-5641-E-T: Weld overlay encapsulating pressurizer spray nozzle-to-safe end dissimilar metal weld and the adjacent safe end-to-pipe weld (Weld No. RCS-517-FW-12).
3. Weld No. 03-X-5644-A-T: Weld overlay encapsulating pressurizer safety nozzle at 81° azimuth-to-safe end dissimilar metal weld and the adjacent safe end-to-pipe weld (Weld No. RCS-516-FW-I).
4. Weld No. 03-X-5648-B-T: Weld overlay encapsulating pressurizer safety nozzle at 147° azimuth-to-safe end dissimilar metal weld and the adjacent safe end-to-pipe weld (Weld No. RCS-516-FW-3).
5. Weld No. 03-X-5649-C-T: Weld overlay encapsulating pressurizer safety nozzle at 212° azimuth-to-safe end dissimilar metal weld and the adjacent safe end-to-pipe weld (Weld No. RCS-516-FW-5).
6. Weld No. 03-X-5650-D-T: Weld overlay encapsulating pressurizer relief nozzle at 278° azimuth-to-safe end dissimilar metal weld and the adjacent safe end-to-pipe weld (Weld No. RCS-513-FW-I).

3.3 Applicable Code Requirement (as stated in IR-3-05, Revision 1)

The inservice inspection of the subject welds was initially performed in accordance with ASME Code, Section XI, IWB-2500, Examination Categories B-F and B-J.

An alternative to the ASME Code, Section XI requirements for the inservice inspection of Class 1 piping, Category B-J and B-F welds was implemented during the second interval based on the Risk-Informed technology developed in accordance with the Westinghouse Owners Group Topical Report "WCAP 14572, Revision I-NP-A". [Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report] The request to use this alternative was submitted to the Nuclear Regulatory Commission on July 25, 2000 with approval received on March 12, 2002.

During the second interval, full structural weld overlays were applied to the subject welds. Inservice inspection for the weld overlays was performed in accordance with approved relief requests IR-2-39 (for Weld No. 03-X-5641-E-T) and IR-2-47 (for the remainder of the listed weld overlays[]).

- 3.4 Licensee Proposed Alternative and Basis for Use¹ (as stated in RR-3-05, Revision 1)
- 3.4.1 Each weld overlay has been examined once during the first or second refueling outage following application of the weld overlay. The weld overlay examinations showed no indication of crack growth or new cracking and will be placed into a unique population within the ISI Program to be examined on a sample basis. Twenty-five percent of this population shall be added to the ISI Program as new welds in accordance with IWB-2412(b).
- 3.4.2 The 25% sample shall consist of the same welds in the same sequence during successive intervals to the extent practical (note that all welds experience pressurizer temperatures).
- 3.4.2.1 These examinations may be deferred to coincide with the vessel nozzle examinations required by Category B-D.
- 3.4.2.2 Examinations during future intervals may be deferred to the end of the interval, provided no additional repair/replacement activities have been performed on the examination item, and no flaws or relevant conditions requiring successive examination in accordance with Attachment 1 [of IR-3-05, Revision 1] are contained in the mitigated weld.
- 3.4.3 The examinations shall be volumetric (ultrasonic) and shall meet the applicable requirements of Appendix VIII. The requirements for the examination volume and required thicknesses shall be as described in Attachment 1 [of IR-3-05, Revision 1], Figures 1(a) "Examination Volume in Full Structural Weld Overlays" and 1(b) "Definition of Thickness t_1 and t_2 for Application of IWB-3514 Acceptance Criteria."
- 3.4.4 Acceptance Criteria
- 3.4.4.1 General
- 3.4.4.1.1 The volumetric examinations shall be evaluated by comparing the examination results with the acceptance standards in [3.4.4.2].
- 3.4.4.1.2 Volumetric examination results shall be compared with recorded results of the preservice examination and prior inservice examinations. Acceptance of welds for continued service shall be in accordance with [3.4.4.2].

¹ Note: The numbering of the paragraphs in this section has been altered slightly from the licensee's submittal to correspond to the SE format.

3.4.4.2 Acceptance

3.4.4.2.1 Acceptance by Volumetric Examination

3.4.4.2.1.1 A weld whose volumetric examination confirms the absence of flaws shall be acceptable for continued service.

3.4.4.2.1.2 Flaws shall meet the acceptance standards of IWB-3514 or be accepted for continued service in accordance with [3.4.4.2.2 or 3.4.4.2.3].

3.4.4.2.1.3 A weld with new planar surface flaws or unexpected or unacceptable growth of existing flaws shall be accepted for continued service in accordance with the provisions of [3.4.4.2.2 or 3.4.4.2.3].

3.4.4.2.2 Acceptance by Repair/Replacement Activity

3.4.4.2.2.1 A weld whose volumetric examination reveals a flaw not acceptable for continued service in accordance with the provisions of [3.4.4.2.3] is unacceptable for continued service until the additional examinations of [3.4.4.3] are satisfied and the weld is corrected by repair/replacement activity in accordance with IWA-4000.

3.4.4.2.2.2 For weld overlay examination volumes (Figure 1(a)) with unacceptable indications in accordance with [3.4.4.2.3.2], the weld overlay shall be removed, including the original defective weld, and the weld shall be corrected by repair/replacement activity in accordance with IWA-4000.

3.4.4.2.3 Acceptance by Evaluation

3.4.4.2.3.1 Previously-evaluated flaws that were mitigated by the full structural weld overlay of Code Case N-770 Table 1 need not be reevaluated nor have additional successive or additional examinations performed if new planar flaws have not been identified or the previously evaluated flaws have remained essentially unchanged.

3.4.4.2.3.2 A weld overlay whose volumetric examination detects planar flaw growth or new planar flaws that exceed the acceptance standards of IWB-3514 is acceptable for continued service without repair/replacement activity if the weld overlay meets the acceptance criteria of IWB-3600 and the additional examinations of [3.4.4.3] are performed. If a planar flaw is detected in the outer 25% of the original weld/base metal thickness for the examination volume it is acceptable for continued service if the crack growth calculations and structural design and sizing calculations required for original weld overlay acceptance show or are revised to show acceptability of the detected flaw. Any indication in the weld overlay material characterized as stress corrosion cracking is unacceptable.

3.4.4.3 Additional Examinations

3.4.4.3.1 Examinations of additional weld overlays during the current outage are required if unacceptable planar flaws are detected in the weld overlay thickness, or if this examination reveals crack growth into the examination volume larger than predicted by the previous [3.4.4.2.3] analysis. The number of additional weld examinations shall be equal to the number of overlaid welds originally scheduled to be performed during the present inspection period.

3.4.4.3.2 If the additional examinations required by [3.4.4.3.1] reveal unacceptable flaws [(3.4.4.2.3.2)], the remaining weld overlays shall be volumetrically examined during the current outage.

4.0 STAFF EVALUATION

ASME Code Case N-770 contains baseline and ISI requirements for unmitigated butt welds fabricated with Alloy 82/182 material and preservice and ISI requirements for mitigated butt welds. The NRC staff's review of IR-3-05, Revision 1 determined that the licensee has thoroughly modeled IR-3-05, Revision 1 on all of the aspects of ASME Code Case N-770 that pertain to ISI of butt welds mitigated by full structural weld overlays. However, the NRC identified several issues which have been addressed by the licensee.

The following lists each of the issues identified by the NRC staff (*italicized text*), as well as how DNC addressed the issue in IR-3-05, Revision 1, and the NRC staff's final evaluation of the request for alternative inspection requirements.

1. *The NRC requires essentially 100% coverage for axial flaws. Paragraph-2500(c) of Code Case N-770 permits examination for axial flaws with inspection coverage limitations provided essentially 100% coverage for circumferential flaws is achieved and the maximum coverage practical is achieved for axial flaws. This requirement on inspection limitations is inconsistent with comparable inspection requirements of the ASME Code, Section XI. Axial flaws can lead to through-wall cracks and leakage of reactor coolant, which is a safety concern.*

IR-3-05, Revision 1, does not contain provisions to allow less than essentially 100% coverage for axial or circumferential flaws. Therefore, the NRC staff concludes that approval of this request for alternative does not authorize less than essentially 100% coverage for axial or circumferential flaws. (Note: Essentially 100% coverage, as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable. The NRC has adopted this definition. ASME Code Case N-460 has been approved for use by the NRC in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 15).

2. *Code Case N-770, Paragraph -3132.3(b) contains the statement that a "flaw is not considered to have grown if the size difference (from a previous examination) is within the measurement accuracy of the nondestructive examination (NDE) technique employed." The "measurement accuracy of the NDE technique employed" is not defined in the Code Case or in the ASME Code. Use of this terminology may result in a departure from the past practice when applying ASME Code, Section XI. Under the requirements of Section XI, one concludes that flaw growth has not occurred when a "previously evaluated flaw has remained essentially unchanged." This wording is necessary to clarify the requirements for determining whether flaw growth has occurred and make the requirements consistent with ASME Code requirements endorsed by the NRC in 10 CFR 50.55a.*

On January 14, 2010, the licensee addressed this issue and incorporated the change in Revision 1 of Relief Request IR-3-05. In the section "Acceptance by Evaluation" of IR-3-05, Revision 1 (paragraph 3.4.4.2.3.1 above), the licensee addresses this issue and states that "previously-evaluated flaws that were mitigated by the full structural weld overlay of Code Case N-770 Table 1 need not be reevaluated nor have additional successive or additional examinations performed if new planar flaws have not been identified or the previously evaluated flaws have remained essentially unchanged." Since the licensee has adopted the wording that is consistent with the ASME Code, the NRC staff is satisfied that IR-3-05, Revision 1, addresses the identified inadequacy.

3. *Inspection Items C and F apply to butt welds mitigated by full structural weld overlays of Alloy 52/152 material. Code Case N-770, Table 1, states that "[t]wenty-five percent of this population shall be added to the ISI Program in accordance with -2410 and shall be examined once each inspection interval" for Inspection Items C and F. Additionally, Note 10 of the Code Case requires that welds in Inspection Items C and F that are not included in the 25% sample be examined prior to the end of the mitigation evaluation period if the plant is to be operated beyond that time. The NRC staff has determined that it is necessary to ensure that welds in the 25% sample are also examined prior to*

the end of the mitigation evaluation period. Inspection prior to the end of the mitigation evaluation period is necessary to ensure that appropriate information has been obtained to verify the condition of the weld overlay and update the analysis for the predicted life of the weld overlay.

In its response to a request for additional information from the NRC staff, the licensee states that the Pressurizer Surge nozzle-to-safe-end weld 03-X-5551-X-T (Inspection Item F) has a design life of 13 years, and that the Pressurizer Safety and Relief nozzle-to-safe-end welds 03-X-5644-A-T, 03X-5648-B-T, 03-X-5649-C-T and 03-X-5650-D-T (Inspection Item C) and the Pressurizer Spray nozzle-to-safe-end weld 03-X-5641-E-T (Inspection Item C) have a design life of 40 years. Since none of the full structural weld overlays addressed by Relief Request IR-3-05 has a design life of less than 10 years, the licensee determined that the requirement to perform at least one inservice examination prior to exceeding the life of the overlay is automatically satisfied by the 25% sample inspection requirements and therefore the licensee did not include this provision in Relief Request IR-3-05, Revision 1. Additionally, the licensee also reiterated that each weld was examined once during the first or second refueling outage following application of the weld overlay.

Based on the information provided by the licensee, the NRC staff concludes that the Pressurizer Surge nozzle-to-safe-end weld 03-X-5551-X-T in Inspection Item F will be examined each interval and thus, prior to the end of the mitigation evaluation period for the overlay. For the Pressurizer Safety and Relief nozzle-to-safe-end welds 03-X-5644-A-T, 03X-5648-B-T, 03-X-5649-C-T and 03-X-5650-D-T and the Pressurizer Spray nozzle-to-safe-end weld 03-X-5641-E-T that fall under Inspection Item C, the 25% of this population of welds that are placed in the ISI Program will be inspected once each inspection interval. Thus, the NRC staff is satisfied that licensee will ensure that the welds in the 25% population will be inspected prior to the end of the mitigation evaluation period.

4. *Code Case N-770 contains information on component thicknesses to be used in application of the acceptance standards of ASME Code, Section XI, IWB-3514, to evaluate flaws detected during preservice inspection of weld overlays. The NRC staff has determined that the ½-inch (13 mm) dimension shown in Figures 2(b) and 5(b) of Code Case N-770 is non-conservative and is requiring the licensee to use a dimension "b" instead of ½ inch, where "b" is equivalent to the nominal thickness of the nozzle or pipe being overlaid, as appropriate. This appropriate dimension is a function of the nominal thickness of the nozzle or pipe being overlaid and not a single specified value for all pipes and nozzles. This change is necessary to ensure that acceptance standards used for evaluation of any flaws detected during inservice inspection of weld overlays assure an appropriate level of safety.*

In the January 14, 2010, letter, the licensee revised Figure 1(b) in IR-3-05, Revision 1 to reflect the dimension "b" which is equivalent to the nominal thickness of the nozzle or pipe being overlaid, as appropriate. However, in lieu of use of the dimension "b," the licensee's figure uses the dimensions "x" and "y" which are noted to be equivalent to the nominal thickness of the nozzle end preparation or the pipe, respectively, being overlaid. The NRC staff is satisfied that the licensee's change to Figure 1(b) appropriately reflects

dimensions that are a function of the nominal thickness of the nozzle or pipe being overlaid.

DNC also stated, in the May 6, 2010, letter that the percentage of pressurizer weld overlays to be inspected within the next 2 years will be consistent with the requirements of IWB-2412(b) of ASME Section XI and should any crack growth exceeding the acceptance criteria of Table IWB-3514 of ASME Section XI be identified or should any new cracking be identified, DNC shall provide a report to the NRC prior to placing the weld back in service.

5.0 CONCLUSION

Based on the discussion above, the NRC staff concludes that the ISI program proposed by the licensee in IR-3-05, Revision 1, provides comprehensive criteria for the licensee to perform ISI of weld overlays applied as a repair or for preemptive measures due to susceptibility of the underlying weld to primary water stress corrosion cracking. The NRC staff also concludes, based on the above discussion, that IR-3-05, Revision 1, provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the use of Request IR-3-05, Revision 1, for Weld Numbers 03-X-5551-X-T, 03-X-5641-E-T, 03-X-5644-A-T, 03-X-5648-B-T, 03-X-5649-C-T, and 03-X-5650-D-T for the Third 10-Year ISI Interval at MPS3.

All other ASME Code, Section XI, requirements for which relief has not been specifically requested and approved remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: C. Nove

Date: June 11, 2010

D. Heacock

- 2 -

If you have any questions, please contact the Project Manager, Carleen Sanders, at 301-415-1603.

Sincerely,

/ra/

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

Docket No. 50-423

Enclosure:
As stated

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***By Memo Dated**

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