

October 18, 2015

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Serial No. 15-512
NSSL/MLC R0
Docket No. 50-336
License No. DPR-65

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 2
REVISION TO ALTERNATIVE REQUEST RR-04-20, USE OF WELD OVERLAYS AS
AN ALTERNATIVE REPAIR AND MITIGATION TECHNIQUE - RE: ALTERNATIVE
TO PRE-WELD OVERLAY LIQUID PENETRANT EXAMINATION

By letter dated April 11, 2014 (Reference 1), Dominion Nuclear Connecticut, Inc. (DNC) submitted Alternative Request RR-04-20, "Use of Weld Overlays as an Alternative Repair and Mitigating Technique," for Millstone Power Station Unit 2 (MPS2) to allow the application of full structural weld overlays (FSWOLs) over certain specific dissimilar metal welds (DMWs) during Refueling Outage 23. The specific welds are located in the 2-inch nominal piping of the reactor coolant system (RCS) hot leg drain line and cold leg letdown line. By letter dated April 24, 2015 (Reference 2), pursuant to 10 CFR 50.55a(z)(1), the Nuclear Regulatory Commission (NRC) staff approved Alternative Request RR-04-20.

On October 15, 2015, following installation of the FSWOLs at MPS2, DNC identified that the initial (pre-overlay) liquid penetrant (PT) base metal examinations performed on October 9, 2015 and required by Alternative Request RR-04-20, were not performed in accordance with the applicable examination procedure prior to beginning application of the weld overlay. The pre-overlay PT examinations on the base metal cannot be credited as they were not performed in compliance with the examination procedure.

Since the FSWOLs were installed prior to discovery that the base metal PTs were improperly performed, performing the required PT examination of the overlaid base metal is no longer practicable and would result in a hardship without a compensating increase in quality and safety since rework of the RCS welds would result in significant occupational dose. Therefore, pursuant to 10 CFR 50.55a(z)(2), DNC is requesting approval of an alternative to the base metal PT examination requirement of RR-04-20. Specifically, DNC proposes to credit the phased array ultrasonic technique examination of the final weld overlay in lieu of the pre-overlay base metal PT examination of the RCS hot leg drain line and RCS cold leg letdown line welds. The attachment to this letter provides the technical basis for this request.

MPS2 is currently in Refueling Outage 23 with all fuel removed from the reactor vessel. Based on the current refueling outage schedule, DNC expects to initiate core loading activities on October 19, 2015 at 2200 hours. Resolution of the pre-weld overlay PT examination is requested prior to the initiation of core loading activities. Therefore, DNC requests approval of this proposed alternative by 2200 hours on October 19, 2015. This alternative request has been approved by the Facility Safety Review Committee.

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NRR

If you have any questions in regard to this submittal, please contact Ms. Wanda Craft at (804) 273-4687.

Sincerely,



Mark D. Sartain
Vice President – Nuclear Engineering

Commitments made in this letter: None

Attachment:

Revision to Alternative Request RR-04-20, Use of Weld Overlays as an Alternative Repair and Mitigation Technique, RE: Alternative to Pre-Weld Overlay Liquid Penetrant Examination.

References:

- 1) DNC Letter 14-114, "Millstone Power Station Unit 2 – Alternative Request RR-04-20, Use of Weld Overlays as an Alternative Repair and Mitigation Technique," dated April 11, 2014 (ADAMS Accession No. ML14112A071).
- 2) NRC Letter, "Millstone Power Station, Unit No. 2 – Alternative Use of Weld Overlay as Repair and Mitigation Technique (TAC No. MF3918)," dated April 24, 2015 (ADAMS Accession No. ML15082A409).

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ATTACHMENT

**REVISION TO ALTERNATIVE REQUEST RR-04-20, USE OF WELD OVERLAYS
AS AN ALTERNATIVE REPAIR AND MITIGATION TECHNIQUE**

**RE: ALTERNATIVE TO PRE-WELD OVERLAY
LIQUID PENETRANT EXAMINATION**

**MILLSTONE POWER STATION UNIT 2
DOMINION NUCLEAR CONNECTICUT, INC. (DNC)**

REVISION TO ALTERNATIVE REQUEST RR-04-20
USE OF WELD OVERLAYS AS AN ALTERNATIVE REPAIR AND
MITIGATION TECHNIQUE

RE: ALTERNATIVE TO PRE-WELD OVERLAY
LIQUID PENETRANT EXAMINATION

*Proposed Revised Alternative
in Accordance with 10 CFR 50.55a(z)(2)*

- Hardship Without a Compensating Increase in Quality and Safety -

1.0 American Society of Mechanical Engineers (ASME) Code Components Affected

ASME Code Class: Code Class 1
Reference: ASME Code, Section XI, IWA-4000
Examination Category: Not applicable
Item Number: Code Case N-722-1, Item Nos. B15.210 and B15.215
Code Case N-770-1, Inspection Item A-2 and B
Description: Class 1 piping dissimilar metal welds (DMWs) with Alloy 82/182 weld material susceptible to primary water stress corrosion cracking (PWSCC)
Components: Millstone Power Station Unit 2 (MPS2) 2-inch nominal pipe size (NPS) Reactor Coolant System (RCS) loop 1 hot leg drain line welds and loop 2 cold leg letdown line welds as indicated in Table 1.

Table 1

Nozzle-to-safe-end Welds	Adjacent SS Safe-end-to-elbow or pipe Welds
2-inch NPS RCS Hot Leg Drain Line Welds	
BPD-C-1001	BPD-C-1003
2-inch NPS RCS Cold Leg Letdown Line Welds	
BPD-C-4000	BPD-C-4002

2.0 Applicable Code Edition and Addenda

ASME Code, Section XI, 2004 Edition (No Addenda)

3.0 Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, No Addenda, IWA-4000

ASME Code, Section XI, 2001 Edition, No Addenda, Appendix VIII, Supplement 10

ASME Code, Section XI, 2001 Edition, No Addenda, Appendix VIII, Supplement 11

ASME Code Case N-722-1

ASME Code Case N-770-1

4.0 Reason for Request

By letter dated April 11, 2014 (Reference 7.11), Dominion Nuclear Connecticut, Inc. (DNC) submitted Alternative Request RR-04-20, "Use of Weld Overlays as an Alternative Repair and Mitigating Technique," for MPS2 to allow the application of full structural weld overlays (FSWOLs) over certain specific DMWs during Refueling Outage 23 (2R23) for mitigation of PWSCC. The specific welds are located in the 2-inch nominal piping of the RCS hot leg drain line and cold leg letdown line. By letter dated April 24, 2015 (Reference 7.12), pursuant to 10 CFR 50.55a(z)(1), the Nuclear Regulatory Commission (NRC) staff approved Alternative Request RR-04-20.

On October 15, 2015, following installation of the FSWOLs at MPS2, DNC identified that the initial (pre-overlay) liquid penetrant (PT) base metal examinations performed on October 9, 2015 and required by Alternative Request RR-04-20, were not performed in accordance with the applicable examination procedure prior to beginning application of the weld overlay. The pre-overlay PT examinations on the base metal cannot be credited as they were not performed in compliance with the examination procedure.

Since the FSWOLs were installed prior to discovery that the base metal PTs were improperly performed, performing the required PT examination of the overlaid base metal would result in a hardship without a compensating increase in quality and safety. Rework of the RCS welds would result in a significantly higher dose than the approximate 6.3 rem of dose received from the initial FSWOL work. Therefore, pursuant to 10 CFR 50.55a(z)(2), DNC requests approval of an alternative to the base metal PT examination requirements of RR-04-20.

5.0 Proposed Alternative and Basis for Use

5.1 Proposed Alternative

DNC is requesting approval of an alternative to the base metal PT examination requirements of RR-04-20. Specifically, DNC proposes to credit the phased array ultrasonic technique (PAUT) examination of the final weld overlay in lieu of the pre-overlay base metal PT examination of the RCS hot leg drain line and RCS cold leg letdown line welds.

5.2 Basis for Use

Purpose of the Pre-Weld Overlay PT Examination Requirement

Alternate Request RR-04-20, Attachment 1, Enclosure 1, Paragraph 1(d) required a PT examination be performed on the surface to be overlaid prior to application of the weld overlay. The PT examination requirement was derived from and is consistent with ASME Code rules for application of weld overlays (e.g. N-504-4 paragraph (c), N-740-2 paragraph 1.2(d), and ASME XI Non-mandatory Appendix Q article Q2000(b)).

The alternative request required the pre-weld overlay PT examination primarily to reduce the risk that the quality of the weld overlay would be adversely affected by potential defects or flaws that might exist in the area covered by the weld overlay.

For example, if PWSCC cracking were to be present in the underlying 82/182 material, it may contain boric acid and other residues that could be drawn into the weld overlay. Such contaminants could cause cracking or weld porosity in the first and subsequent layers of the weld overlay. Minor surface flaws may also exist in the low alloy steel, stainless steel safe-end, stainless steel safe-end to pipe weld, and stainless steel piping. If present, these flaws could potentially be incorporated into the first few layers of weld overlay in a similar manner. By confirming a satisfactory PT examination prior to installation of the weld overlay, the risk of degrading weld overlay quality (and the commercial risk of potentially failing the final volumetric examination) is reduced. However, the final volumetric examination of the weld overlays was acceptable. This examination provided coverage of the weld overlay material and the interface with the underlying base material. In addition, the examination volume included the outer 25% of the underlying welds and adjacent base material for a distance of ½ inch from the weld toe on each side of the welds. Surface flaws (if any) that may have been detected by the pre-overlay PT examination, but not detected by the post-overlay volumetric non-destructive examination (NDE), would be small and not cause any significant degradation of the weld overlay quality.

Acceptability of the Proposed Alternative

The FSWOL design is based upon the concept of an integral layer of non-PWSCC susceptible weld material that has a thickness such that an assumed planar flaw through the original nozzle, weld or safe-end material would still be acceptable under the rules of ASME Section XI IWB-3640. Both Code Case N-740-2 and N-504-4 contain design criteria derived from this basic requirement. Other requirements relate to consideration of flaw growth and adequacy of load transfer across the flawed original material. The weld overlay therefore achieves its structural integrity based upon the specified thickness and axial extent of weld overlay material, the fusion bond of the applied weld overlay metal to the base metal, and the integrity of the deposited weld overlay. The overlay welding process itself is the chief contributor to assuring the latter two requirements. The PT surface examination performed on the base metal prior to the overlay addresses the overlay/base material bond integrity. However, its practical impact is limited to providing assurance that the first layers of weld overlay will not develop flaws that would become embedded or require repair upon detection by the final PAUT examination.

In lieu of PT examination of the base metal, the PAUT examination technique can be used on the completed FSWOLs in combination with properly performed PT examination of the final overlay to provide proof of structural integrity and FSWOL level of quality. The following provides an evaluation of the NDE performed to assess the structural condition of the FSWOL material and underlying base material.

A fully encoded PAUT examination was performed on the nozzle to safe-end DMWs and adjacent base material during the previous 2R22 refueling outage. The examination procedure was qualified by performance demonstration in accordance with ASME Section XI, Appendix VIII, Supplement 10 requirements using the Performance Demonstration Initiative (PDI) Program. These examinations resulted in no recordable indications.

During the current Refueling Outage 23, the following NDE was performed:

- A bare metal visual examination of the Alloy 600 welds and adjacent base material was performed in accordance with Code Case N-770-1. This examination was performed prior to performing FSWOL work. No recordable indications were identified.
- The final FSWOL surfaces and adjacent base materials received a final PT examination, which resulted in no recordable indications. These PT examinations were in compliance with a written procedure meeting the requirements of ASME Section V, Article 6.

- The final FSWOLs were examined using non-encoded PAUT qualified by performance demonstration. The procedure performance demonstration was completed in accordance with ASME Section XI, Appendix VIII, Supplement 11 requirements using the PDI Program. The PAUT examination resulted in no recordable indications within the examination volume.

The PAUT examination performed on the final FSWOLs is qualified to:

- Examine the FSWOL material to assure no lack of bond (LOB) and/or lack of fusion (LOF) exists at the interface between the base metal and overlay.
- Examine the overlay weld material to assure no welding defects such as inter-bead lack of fusion or cracks are present.
- Locate and size existing cracks in the original weld or base material. Of primary concern are cracks that may have propagated into the upper 25% of the original weld or base material, or have extended into the overlay material during welding.

In addition, in accordance with the requirements of Alternative Request RR-04-20, the FSWOLs will be reexamined using PAUT examination techniques and procedures within two refueling cycles.

Therefore, the use of the bare metal visual examination prior to welding, PAUT, and final FSWOL PT examinations provide reasonable assurance of the quality and structural integrity of the FSWOLs on the RCS hot leg drain line and RCS cold leg letdown line welds and are an acceptable alternative to the performance of pre-overlay PT surface examinations of the welds' base metal.

5.3 Conclusion

Pursuant to 10 CFR 50.55a(z)(2), DNC is requesting approval of an alternative to the base metal PT examination requirements of RR-04-20. Specifically, DNC proposes to credit the PAUT examination of the final weld overlay in lieu of the pre-overlay base metal PT examination of the RCS hot leg drain line and RCS cold leg letdown line welds.

Since the FSWOLs were installed prior to discovery that the base metal PT examinations were not properly performed as required by the applicable examination procedure, performing the required PT examination of the overlaid base metal would result in a hardship without a compensating increase in the level of quality and safety.

The PAUT examinations already performed are qualified to examine the weld overlay weld material and interface between the overlay and underlying base material. The PAUT examination did not identify any recordable indications.

This request is based on the following:

- PT examination of the subject welds' pre-weld overlay base metal cannot be re-performed due to the welds being covered with FSWOLs, and
- The initial FSWOL work resulted in a total occupational radiation dose of approximately 6.3 rem. Rework of the RCS welds would result in significantly higher occupational dose than was received during the initial FSWOL work, and
- The PAUT examination already performed provides assurance of the quality, safety, and structural integrity of the FSWOLs on the RCS hot leg drain line and RCS cold leg letdown line welds.

6.0 DURATION OF THE PROPOSED REQUEST

This proposed alternative is requested for the remainder of the current MPS2 fourth 10-year In-Service Inspection Interval, which is scheduled to end on March 31, 2020.

7.0 REFERENCES

- 7.1 ASME Code, Section XI, 2004 Edition, No Addenda, IWA-4000.
- 7.2 U.S. NRC, Regulatory Guide 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1, August 2014.
- 7.3 ASME Code Case N-504-4, Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1, July 14, 2006.
- 7.4 ASME Code Case N-740, N-740-1 and N-740-2, Full Structural Dissimilar Metal Weld Overlay for Repair or Mitigation of Class 1, 2, and 3 Items, Section XI, Division 1, November 10, 2008
- 7.5 ASME Code, Section XI, 2001 Edition, No Addenda, Appendix VIII, Supplement 10.
- 7.6 ASME Code, Section XI, 2001 Edition, No Addenda, Appendix VIII, Supplement 11.

- 7.7 Westinghouse report WCAP-16896, "Millstone Unit 2 RCS Surge, Spray Shutdown Cooling, Safety Injection, Charging Inlet, and Letdown/Drain Nozzles Structural Weld Overlay Qualification," Rev. 2, dated June 2009.
- 7.8 DNC Letter 09-376, "Millstone Power Station Unit 2, Request RR-89-61, Revision 2, Alternative Repair and Mitigation Requirements for Structural Weld Overlays," dated July 23, 2009 (ADAMS Accession No. ML092090215).
- 7.9 Westinghouse Letter LTR-MRCDA-14-11, Rev. 1, "Applicability Review of Current Millstone Unit 2 Drain Nozzle SWOL Documents," dated February 19, 2014.
- 7.10 NRC letter, H. K. Chernoff to D. A. Heacock, "Millstone Power Station, Unit No. 2 – Relief Request RR-89-61, Revision 2, Regarding the Use of Weld Overlays as an Alternative Repair (TAC NO. ME1765)," dated October 15, 2009.
- 7.11 DNC Letter 14-114, "Millstone Power Station Unit 2 – Alternative Request RR-04-20, Use of Weld Overlays as an Alternative Repair and Mitigation Technique," dated April 11, 2014 (ADAMS Accession No. ML14112A071).
- 7.12 NRC Letter, "Millstone Power Station, Unit No. 2 – Alternative Use of Weld Overlay as Repair and Mitigation Technique (TAC No. MF3918)," dated April 24, 2015 (ADAMS Accession No. ML15082A409).