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

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NLOS/WDC	R0
Docket No.	50-336
License No.	DPR-65

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 2
ALTERNATIVE REQUEST RR-04-22 FOR IMPLEMENTATION OF EXTENDED REACTOR VESSEL INSERVICE INSPECTION INTERVAL

Pursuant to 10 CFR 50.55a(z)(1), Dominion Nuclear Connecticut, Inc. (DNC) requests an alternative to the requirement of the American Society of Mechanical Engineers (ASME) Code, Section XI, Paragraph IWB-2412, Inspection Program B, for Millstone Power Station Unit 2 (MPS2) which requires examination of identified reactor vessel pressure-retaining welds (Examination Category B-A and B-D) once each 10-year interval. The proposed alternative would extend the current examination frequency from 10 years to 20 years.

The current interval can be extended based on the negligible change in risk and by meeting the guidance provided in Regulatory Guide 1.174, Revision 1 for risk informed decisions. The methodology used to conduct this analysis is defined in the study WCAP-16168-NP-A, Revision 3, "Risk Informed Extension of the Reactor Vessel In-Service Inspection [ISI] Interval." This study focuses on risk assessments of materials within the beltline region of the reactor vessel wall. The results of the calculations for MPS2 were compared to those obtained from the Combustion Engineering pilot plant evaluated in WCAP-16168-NP-A, Revision 3. The parameters for MPS2 are bounded by the results of the Combustion Engineering pilot plant, which qualifies MPS2 for an ISI interval extension.

DNC has concluded that the proposed alternative provides an acceptable level of quality and safety, in accordance with 10 CFR 50.55a(z)(1). The justification for the proposed alternative along with the supporting information is provided in the attachment to this letter.

The next examinations of the Examination Category B-A and B-D welds are scheduled for spring 2017 (Refueling Outage 24); therefore, DNC requests approval of this alternative by February 28, 2017 to support extension of these examinations.

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

Sincerely,

Mark D. Sartain
Vice President – Nuclear Engineering

A047
NRR

Commitments made in this letter: None

Attachment:

1) Proposed Alternative Request RR-04-22 for Millstone Power Station Unit 2

cc:

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ATTACHMENT 1

PROPOSED ALTERNATIVE REQUEST RR-04-22
FOR MILLSTONE POWER STATION UNIT 2

MILLSTONE POWER STATION UNIT 2
DOMINION NUCLEAR CONNECTICUT, INC.

Proposed Alternative Request RR-04-22 for Millstone Power Station Unit 2

In Accordance with 10 CFR 50.55a(z)(1)
-Alternative Provides Acceptable Level of Quality and Safety-

1. ASME Code Component(s) Affected

The affected component is the Millstone Power Station Unit 2 (MPS2) reactor vessel (RV); specifically, the following American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (BPV) Code, Section XI (Reference 8.1) examination categories and item numbers covering examinations of the RV. These examination categories and item numbers are from IWB-2500 and Table IWB-2500-1 of the ASME BPV, Code Section XI.

Category B-A welds are defined as "Pressure Retaining Welds in Reactor Vessel"
Category B-D welds are defined as "Full Penetration Welded Nozzles in Vessels"

Examination Category	Item No.	Description
B-A	B1.11	Circumferential Shell Welds
B-A	B1.12	Longitudinal Shell Welds
B-A	B1.21	Circumferential Head Welds
B-A	B1.22	Meridional Head Welds
B-A	B1.30	Shell-to-Flange Weld
B-A	B1.40	Head-to-Flange Weld
B-D	B3.90	Nozzle-to-Vessel Welds
B-D	B3.100	Nozzle Inside Radius Section

(Throughout this request the above examination categories are referred to as "the subject examinations" and the ASME BPV Code, Section XI, is referred to as "the Code.")

2. Applicable Code Edition and Addenda

ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 2004 Edition (Reference 8.1).

3. Applicable Code Requirement

IWB-2412, Inspection Program B, requires volumetric examination of essentially 100% of RV pressure-retaining welds, identified in Table IWB-2500-1, once each 10-year interval. The MPS2 fourth 10-year inservice inspection (ISI) interval is scheduled to end on March 31, 2020. The applicable Code for the fifth 10-year ISI interval will be selected in accordance with the requirements of 10 CFR 50.55a.

4. Reason for Request

An alternative is requested from the requirement of IWB-2412, Inspection Program B, that volumetric examination of essentially 100% of RV pressure-retaining Examination Category B-A and B-D welds be performed once each 10-year interval. Extension of the interval between examinations of Category B-A and B-D welds from 10 years to up to 20 years will result in a reduction in man-rem exposure and examination costs. DNC has concluded that the proposed alternative provides an acceptable level of quality and safety.

5. Proposed Alternative and Basis for Use

Dominion Nuclear Connecticut, Inc. (DNC) proposes to perform the fourth ASME Code required volumetric examination of the MPS2 RV full penetration pressure-retaining Examination Category B-A and B-D welds in the fifth ISI interval in 2028 plus or minus one refueling outage. The proposed inspection date for MPS2 is consistent with the schedule presented in the latest implementation plan, OG-10-238 (Reference 8.2).

In accordance with 10 CFR 50.55a(z)(1), an alternate ISI interval is requested on the basis that the current ISI interval can be extended based on the negligible change in risk and by meeting the guidance provided in Regulatory Guide 1.174 for risk informed decisions (Reference 8.3).

The methodology used to conduct this analysis is based on that defined in the study WCAP-16168-NP-A, Revision 3, "Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval" (Reference 8.4). This study focuses on risk assessments of materials within the beltline region of the RV wall. The results of the calculations for MPS2 were compared to those obtained from the Combustion Engineering pilot plant evaluated in WCAP-16168-NP-A, Revision 3. Appendix A of the WCAP identifies the parameters to be compared. Demonstrating that the parameters for MPS2 are bounded by the results of the Combustion Engineering pilot plant qualifies MPS2 for an ISI interval extension. Table 1 below lists the critical parameters investigated in the WCAP and compares the results of the Combustion Engineering pilot plant to those of MPS2. Tables 2 and 3 provide additional information that was requested by the NRC and included in Appendix A of Reference 8.4.

Table 1: Critical Parameters for the Application of Bounding Analysis for MPS2

Parameter	Pilot Plant Basis	Plant-Specific Basis	Additional Evaluation Required?
Dominant Pressurized Thermal Shock (PTS) Transients in the NRC PTS Risk Study are Applicable	NRC PTS Risk Study (Reference 8.5)	PTS Generalization Study (Reference 8.6)	No
Through-Wall Cracking Frequency (TWCF)	3.16E-07 Events per year (Reference 8.4)	1.49E-11 Events per year (Calculated per Reference 8.4)	No
Frequency and Severity of Design Basis Transients	13 heatup/cooldown cycles per year (Reference 8.4)	Bounded by 13 heatup/cooldown cycles per year	No
Cladding Layers (Single/Multiple)	Single Layer (Reference 8.4)	Single Layer	No

Table 2 provides a summary of the latest RV inspection for MPS2 and evaluation of the recorded indications. This information confirms that satisfactory examinations have been performed on the MPS2 RV.

Table 2: Additional Information Pertaining to Reactor Vessel Inspection for MPS2

Inspection methodology:	The latest RV ISI was conducted in accordance with the requirements of Appendix VIII of the ASME Code, Section XI, 1995 Edition with Editions and Addenda through 2000, as modified by the Performance Demonstration Initiative program. Evaluation of recordable indications was performed to the acceptance standards of Section XI, 1989 Edition. Future ISIs will be performed to ASME Section XI, Appendix VIII requirements.
Number of past inspections:	Three 10-year ISIs have been performed.
Number of indications found:	There were fourteen total indications identified in the beltline region during the most recently completed ISI. These subsurface indications are located in the upper to intermediate shell circumferential weld seam (Item 19 in Table 3), the intermediate to lower shell circumferential weld seam (Item 20 in Table 3), and the lower shell longitudinal weld seam (Item 18 in Table 3). All fourteen indications are acceptable per Table IWB-3510-1 of Section XI of the ASME Code. There are two indications within the inner 1/10th or inner 1" of the reactor vessel wall thickness. The two indications are acceptable per the requirements of the Alternate Pressurized Thermal Shock (PTS) Rule, 10 CFR 50.61a (Reference 8.7). A disposition of the two flaws against the limits of the Alternate PTS Rule is shown in the table below. No indications are located within the weld material of the reactor vessel beltline.
Proposed inspection schedule for balance of plant life:	The fourth ISI is scheduled for 2017. This inspection will be performed in 2028 plus or minus one refueling outage. The proposed inspection date for MPS2 is consistent with the schedule presented in the latest implementation plan, OG-10-238 (Reference 8.2).

Through-Wall Extent, TWE (in.)		Scaled maximum number of plate flaws	Number of plate flaws (Axial/Circ.)
TWE_{MIN}	TWE_{MAX}		
0	0.075	No Limit	0
0.075	0.375	102	2 (1/1)
0.125	0.375	40	1 (1/0)
0.175	0.375	11	0
0.225	0.375	4	0
0.275	0.375	2	0
0.325	0.375	1	0
0.375	Infinite	0	0

Table 3 summarizes the inputs and outputs for the calculation of through-wall cracking frequency (TWCF).

Table 3: Details of TWCF Calculation for MPS2 at 54 Effective Full-Power Years (EFPY)

Inputs

Reactor Coolant System Temperature, T_C [°F]			N/A	Inter. & Lower Shell T_{wall} [inches]				8.94
				Nozzle Shell T_{wall} [inches]				11.06
No.	Region and Component Description	Material Heat No.	$Cu^{(1)}$ [wt%]	$Ni^{(1)}$ [wt%]	R.G. 1.99 Pos.(1)	$CF^{(1)}$ [°F]	$RT_{NDT(u)}{}^{(1)}$ [°F]	Fluence [10^{19} neutron/cm2 E>1.0 MeV][2]
1	Upper Shell Plate C-504-2	C5809-2	0.13	0.56	1.1	89.8	22	0.243
2	Upper Shell Plate C-504-3	C5809-1	0.13	0.56	1.1	89.8	15	0.243
3	Upper Shell Plate C-504-1	C5804-2	0.13	0.58	1.1	90.4	22	0.243
4	Intermediate Shell Plate C-505-1	C5843-1	0.13	0.61	1.1	91.3	8.1	3.83
5	Intermediate Shell Plate C-505-2	C5843-2	0.13	0.62	1.1	91.5	17.5	3.83
6	Intermediate Shell Plate C-505-3	C5843-3	0.13	0.62	1.1	91.5	5.0	3.83
7	Lower Shell Plate C-506-1	C5667-1	0.15	0.60	1.1	110.0	7.0	3.83
8	Lower Shell Plate C-506-3	A5518-1	0.14	0.66	1.1	101.5	-19.2	3.83
9	Lower Shell Plate C-506-2	C5667-2	0.15	0.61	1.1	110.3	-33.7	3.83
10	Upper Shell Long. Weld 1-203A	12008 & 21935	0.22	0.867	1.1	210.7	-56	0.243
11	Upper Shell Long. Weld 1-203B	12008 & 21935	0.22	0.867	1.1	210.7	-56	0.243
12	Upper Shell Long. Weld 1-203C	12008 & 21935	0.22	0.867	1.1	210.7	-56	0.243
13	Intermediate Shell Long. Weld 2-203A	A8746	0.15	0.13	1.1	77.7	-56	3.83
14	Intermediate Shell Long. Weld 2-203B	A8746	0.15	0.13	1.1	77.7	-56	3.83
15	Intermediate Shell Long. Weld 2-203C	A8746	0.15	0.13	1.1	77.7	-56	3.83
16	Lower Shell Long. Weld 3-203A	A8746	0.15	0.13	1.1	77.7	-56	3.83
17	Lower Shell Long. Weld 3-203B	A8746	0.15	0.13	1.1	77.7	-56	3.83
18	Lower Shell Long. Weld 3-203C	A8746	0.15	0.13	1.1	77.7	-56	3.83
19	Upper to Intermediate Shell Circ. Weld 8-203	33A277& 10137	0.30	0.165	1.1	143.4	-56	0.243
20	Inter. to Lower Shell Circ. Weld 9-203	90136 & 10137	0.27	0.07	1.1	124.3	-56.3	3.83

Outputs

Methodology Used to Calculate ΔT_{30}:			Regulatory Guide 1.99, Revision 2[3]			
	Controlling Material Region No. (From Above)	RT_{MAX-XX} [°R]	Fluence [10^{19} Neutron/cm^2, E > 1.0 MeV]	FF (Fluence Factor)	ΔT_{30} [°F]	$TWCF_{95-XX}$
Limiting Axial Weld - AW	7	614.81	3.83	1.3467	148.14	0.00E+00
Limiting Plate - PL	7	614.81	3.83	1.3467	148.14	5.96E-12
Circumferential Weld - CW	7	614.81	3.83	1.3467	148.14	0.00E+00
$TWCF_{95-TOTAL}(\alpha_{AW}TWCF_{95-AW} + \alpha_{PL}TWCF_{95-PL} + \alpha_{CW}TWCF_{95-CW})$:						1.49E-11

(1) *Material properties based on plant-specific analysis of record*
(2) Fluence inputs per Reference 8.8
(3) Reference 8.9

6. Duration of Proposed Alternative

This request is applicable to the MPS2 ISI program for the fourth and fifth 10-year inspection intervals.

7. Precedents

7.1 "McGuire Nuclear Station, Unit 2, Relief 10-MN-002 to Extend the Inservice Inspection Interval for Reactor Vessel Category B-A and B-D Welds (TAC Nos. ME7329 and ME 7330)," dated September 6, 2012 (ADAMS Accession Number ML12249A175).

7.2 "Surry Power Station Units 1 and 2 – Relief Implementing Extended Reactor Vessel Inspection Interval (TAC Nos. ME8573 and ME8574)," dated April 30, 2013 (ADAMS Accession Number ML13106A140).

7.3 "Vogtle Electric Generating Plant, Units 1 and 2 – Request for Alternatives VEGP-ISI-ALT-05 and VEGP-ISI-ALT-06 (TAC Nos. MF2596 and MF2597)," dated March 20, 2014 (ADAMS Accession Number ML14030A570).

7.4 "Catawba Nuclear Station Units 1 and 2: Proposed Relief Request 13-CN-003, Request for Alternative to the Requirement of IWB-2500, Table IWB-2500-1, Category B-A and Category B-D for Reactor Pressure Vessel Welds (TAC Nos. MF1922 and MF1923)," dated March 26, 2014 (ADAMS Accession Number ML14079A546).

7.5 "Sequoyah Nuclear Plant, Units 1 and 2 – Requests for Alternatives 13-ISI-1 and 13-ISI-2 to Extend the Reactor Vessel Weld Inservice Inspection Interval (TAC Nos. MF2900 and MF2901)," dated August 1, 2014 (ADAMS Accession Number ML14188B920).

7.6 "Byron Station, Unit No. 1 – Relief from Requirements of the ASME Code to Extend the Reactor Vessel Inservice Inspection Interval (TAC No. MF3596)," dated December 10, 2014 (ADAMS Accession Number ML14303A506).

7.7 "Wolf Creek Generating Station – Request for Relief Nos. I3R-08 and I3R-09 for the Third 10-Year Inservice Inspection Program Interval (TAC Nos. MF3321 and MF3322)," dated December 10, 2014 (ADAMS Accession Number ML14321A864).

7.8 "Callaway Plant, Unit 1 – Request for Relief I3R-17, Alternative to ASME Code Requirements Which Extends the Reactor Vessel Inspection Interval from 10 to 20 Years (TAC No. MF3876)," dated February 10, 2015 (ADAMS Accession Number ML15035A148).

8. References

8.1 ASME Boiler and Pressure Vessel Code, Section XI, 2004 Edition, American Society of Mechanical Engineers, New York.

8.2 PWROG Letter OG-10-238, "Revision to the Revised Plan for Plant Specific Implementation of Extended Inservice Inspection Interval per WCAP-16168-NP, Revision 1, "Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval." PA-MSC-0120," July 12, 2010 (ADAMS Accession Number ML11153A033).

8.3 NRC Regulatory Guide 1.174, Revision 1, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," November 2002.

8.4 Westinghouse Report WCAP-16168-NP-A, Revision 3, "Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval," October 2011 (ADAMS Accession Number ML11306A084).

8.5 NRC NUREG-1874, "Recommended Screening Limits for Pressurized Thermal Shock (PTS)," March 2010.

8.6 NRC Letter Report, "Generalization of Plant-Specific Pressurized Thermal Shock (PTS) Risk Results to Additional Plants," December 14, 2004 (ADAMS Accession Number ML042880482).

8.7 NRC Code of Federal Regulations, 10 CFR Part 50.61a, "Alternate Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," Federal Register, Volume 75, No. 1, dated January 4, 2010 and No. 22 with corrections to part (g) dated February 3, 2010, March 8, 2010, and November 26, 2010.

8.8 Westinghouse Report WCAP-16012, Revision 0, "Analysis of Capsule W-83 from the Dominion Nuclear Connecticut Millstone Unit 2 Reactor Vessel Radiation Surveillance Program," February 2003.

8.9 NRC Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," May 1988.