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Dominion

APR 30 2002

Docket No. 50-336
B18637

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

Millstone Nuclear Power Station, Unit No. 2
Response to NRC Bulletin 2001-01
Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles

On August 3, 2001, the Nuclear Regulatory Commission (NRC) issued Bulletin 2001-01,[1] "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," to the industry. Question five of the Bulletin required information on vessel head penetration inspections and repairs to be submitted within 30 days following restart from the next refueling outage. Millstone Unit No. 2 completed its most recent refueling outage on April 1, 2002. This submittal is the Dominion Nuclear Connecticut, Inc., response to question number five of the NRC Bulletin for Millstone Unit No. 2.

There are no regulatory commitments contained within this letter.

Should there be any questions regarding this submittal, please contact Mr. Paul R. Willoughby at (860) 447-1791, extension 3655.

Very truly yours,

DOMINION NUCLEAR CONNECTICUT, INC.

J. Alan Price
Site Vice President - Millstone

Attachment (1)

cc: H. J. Miller, Region I Administrator
R. B. Ennis, NRC Senior Project Manager, Millstone Unit No. 2
NRC Senior Resident Inspector, Millstone Unit No. 2

A088

[1] U.S. Nuclear Regulatory Commission Bulletin 2001-01: "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated August 3, 2001.

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Attachment 1

Millstone Nuclear Power Station, Unit No. 2

Response to Question Five of NRC Bulletin 2001-01

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On August 3, 2001, the Nuclear Regulatory Commission (NRC) issued Bulletin 2001-01,[1] "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," to the industry. Question five of the Bulletin required information on vessel head penetration inspections and repairs to be submitted within 30 days following restart from the next refueling outage. Below is the Dominion Nuclear Connecticut, Inc. (DNC) response for Millstone Unit No. 2.

Question 5a

A description of the extent of VHP nozzle leakage and cracking detected at your plant, including the number, location, size, and nature of each crack detected;

Response

During the recently completed refueling outage (2R14) at Millstone Unit No. 2, ultrasonic (UT) inspections of all 78 penetrations in the reactor vessel head were performed as described in our correspondence dated December 28, 2001,[2] in accordance with NRC Bulletin 2001-01. The inspection technique utilized is capable of detecting both axial and circumferential cracks in the penetrations as well as finding potential leakage paths between the nozzle and the reactor vessel head. These inspections were conducted from underneath the reactor vessel head and included both a demonstrated volumetric exam utilizing ten transducers at varying angles and an examination of the low alloy steel directly adjacent to the nozzles above the weld.

During the course of this inspection, three control element drive mechanism (CEDM) nozzles were determined to contain indications of discontinuities that could be attributed to service induced degradation. Indications were found in CEDM Nozzles 21, 34 and 50.

Nozzle 21

The following table shows the indications found in nozzle 21:

Indication No.	1	2	3	4	5	6
Location	OD downhill	OD downhill	OD downhill	OD downhill	OD downhill	OD downhill
Orientation	Axial	Axial	Axial	Axial	Circ	Axial
Length (in.)	2.04	2.44	.59	2.28	.77	.37

(1) U.S. Nuclear Regulatory Commission Bulletin 2001-01: "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated August 3, 2001.

(2) J. A. Price letter to U.S. Nuclear Regulatory Commission, "Supplemental Response to NRC Bulletin 2001-01,Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated December 28, 2001.

These indications were also confirmed with dye penetrant testing. Axial cracks were determined to have started below the J groove weld and extend along the OD of the tube under the weld, however not into the weld material. The dimensioning of indication No. 2 indicated that it projected from the toe on the tube side of the weld through the root to above the weld along the OD of the tube. Although the crack was found to extend above the weld, the UT technique used for discerning a leak path in the interference fit region concluded that there was no evidence of leakage. To confirm the leak path evaluation, a bare metal visual examination was performed under the insulation of this one penetration and found no evidence of boric acid leakage. The one circumferential crack was within ½" below the toe of the J groove weld.

Nozzle 34

The following table shows the indications found in nozzle 34

Indication No	1	2	3	4	5	6
Location	OD downhill	OD downhill	OD downhill	OD downhill	OD downhill	OD downhill
Orientation	Axial	Axial	Circ	Circ	Axial	Axial
Length (in.)	.81	.88	.43	.86	1.06	.61
Depth (in.)	.10	.10	.10	.10	.15	.14

These indications were also confirmed with dye penetrant testing. This showed that the axial cracks started below the J groove weld and extended along the OD of the tube up to and under the weld, however not into the weld material. None of these cracks were found to extend past the weld. The circumferential cracks also started within ½" below the J groove weld.

The UT technique for discerning a leak path in the interference fit region concluded that there was no evidence of leakage.

Nozzle 50

The following table shows the indications found in nozzle 50:

Indication No.	1	2
Location	OD downhill	OD downhill
Orientation	Axial	Axial
Length (in.)	1.06	.74
Depth (in.)	.13	.15

These indications were also confirmed with dye penetrant testing. This showed that the two cracks started below the J groove weld and extended along the OD of the tube up to and under the weld, however not into the weld material. None of the cracks in this nozzle extended past the weld.

The UT technique for discerning a leak path in the interference fit region concluded that there was no evidence of leakage.

Question 5b

If cracking is identified, a description of the inspections (type, scope, qualification requirements, and acceptance criteria), repairs, and other corrective actions you have taken to satisfy applicable regulatory requirements. This information is requested only if there are any changes from prior information submitted in accordance with this bulletin.

Response

The three nozzles with cracking were evaluated by the Millstone Station Nuclear Engineering department. Because the indications extended above the lower toe of the J groove weld on the tube OD, a decision was made to repair the nozzles to prevent a potential leak path from forming during subsequent cycles. The repairs were made using the temper bead weld repair process as described in detail in DNC submittals made to the NRC on February 25, 2002,[3] and March 21, 2002.[4] This technique involves cutting away and removing the lower section of the nozzle, where the cracks exist, from the penetration in the reactor head. It is then replaced with a half nozzle made of Alloy 690 which is welded to the remaining portion of the original nozzle and the base metal of the reactor vessel head. This moves the pressure boundary weld from inside the vessel head at the J groove weld to the mid thickness of the head.

Liquid penetrant examinations were conducted on the base metal of the reactor head following removal of the lower portion of the CEDM nozzle prior to replacement with the new Alloy 690 lower nozzle. This surface exam interrogated the low alloy steel vessel head, the remaining J groove weld, and the beveled portion of the original CEDM nozzle. No indications were recorded.

Following the repair, liquid penetrant and UT examinations were performed on the repair welds. These inspections recorded no indications.

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(3) J. Alan Price letter to U.S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 2, Request to Use an Alternative to ASME Code Section XI Repair Welding Requirements by Employing Temper Bead Techniques," dated February 25, 2002.

(4) J. Alan Price letter to U.S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 2, Relief Request RR-89-34, Revision 1, Response to Request for Additional Information," dated March 21, 2002.