

Dominion Nuclear Connecticut, Inc.  
Millstone Power Station  
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Waterford, CT 06385



**Dominion**<sup>SM</sup>

DEC 28 2001

Docket No. 50-336  
B18557

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

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

In a letter dated September 4, 2001,<sup>(1)</sup> Dominion Nuclear Connecticut, Inc. (DNC) provided a response to the Nuclear Regulatory Commission (NRC) Bulletin 2001-01,<sup>(2)</sup> for both Unit Nos. 2 and 3. This initial response indicated that Unit No. 2 would provide additional information to answer questions number four (4) and five (5) based on our continuing assessment of industry experiences. The purpose of this letter is to provide that additional information.

We are available to meet with you to discuss details on our plans and approach prior to implementation.

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.

  
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J. Alan Price, Vice President  
Nuclear Technical Services - Millstone

cc: See next page

<sup>(1)</sup> J. A. Price letter to U.S. Nuclear Regulatory Commission, "Response to NRC Bulletin 2001-01, Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated September 4, 2001.

<sup>(2)</sup> Nuclear Regulatory Commission Bulletin from D. B. Matthews to the industry, "NRC Bulletin 2001-01: Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," dated August 3, 2001.

A088

Attachment (1)

cc: H. J. Miller, Region 1 Administrator  
J. T. Harrison, NRC Project Manager, Millstone Unit No. 2  
NRC Senior Resident Inspector, Millstone Unit No. 2

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Attachment 1

Millstone Nuclear Power Station, Unit No. 2

Supplemental Response to NRC Bulletin 2001-01

Supplemental Response to NRC Bulletin 2001-01

NRC Bulletin 2001-01, Question 4:

4. *If the susceptibility ranking for your plant is greater than 5 EFPY and less than 30 EFPY of the ONS3, addressees are requested to provide the following information:*
- a. *Your plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule.*
  - b. *Your basis for concluding that the inspections identified in 4.a will assure that regulatory requirements are met (see Applicable Regulatory Requirement section). Include the following specific information in this discussion:*
    - (1) *If your future inspection plans do not include a qualified visual examination at the next scheduled refueling outage, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.*
    - (2) *The corrective actions that will be taken, including alternative inspection methods (for example, volumetric examination), if leakage is detected.*

Millstone Unit No. 2 Response

- a. As described in our previous response, Millstone Unit No. 2 has 14.3 effective full power years until reaching the equivalent time of Oconee Unit No. 3 reactor vessel head temperature. This was described in the latest PWR reactor vessel head nozzle primary water stress corrosion cracking assessment submitted to the NRC in an NEI letter dated August 21, 2001.<sup>(3)</sup> The Millstone Unit No. 2 reactor vessel was designed and built by Combustion Engineering (CE). The particular CE design of Millstone Unit No. 2 has two key features which are important considerations for inspection of the reactor vessel head penetrations.

First, insulation on the vessel head is contoured to the shape of the head with very little, if any, room between the insulation and the vessel head. Performing a barehead examination requires removal and replacement of the existing insulation. The removal of the insulation, inspection and re-insulation is dose intensive. In addition, because of the configuration of the insulation, any boric acid found on top of the head would require additional investigation with some under the head inspections. Because of this difficulty, Dominion Nuclear Connecticut, Inc. (DNC) has concluded that external visual examinations with the current insulation package

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<sup>(3)</sup> NEI letter to Dr. Brian Sheron (NRC), "Generic Information for Use by Licensees in Response to NRC Bulletin 2001-01," dated August 21, 2001.

is not prudent. Modifications to the insulation are being evaluated that would allow for barehead visual examinations in future outages.

As stated in our original response, Millstone proactively performed a surface inspection of 100% of the reactor vessel head penetrations (RVHP) in 1997 using eddy current testing (ECT), the best available technology in place at that time. Review of the 1997 effort concludes that the ECT techniques would have detected some of the industry experienced issues described in the Bulletin, but not all.

A second design feature of Millstone Unit No. 2 is the absence of thermal sleeves. This allows for the use of a rotating head ultrasonic technique which incorporates multiple transducers (approximately 10) in a single deployment device, providing for the best possible volumetric examination of the RVHPs available with current technology. This technique utilizes multiple angles in multiple directions, producing the necessary information to assure integrity of the RVHPs. This technique has been successfully demonstrated to detect axial and circumferential flaws in the tube over the weld, as well as in the tube outside of the weld. DNC is working aggressively with our selected vendor to develop additional non-destructive examination (NDE) techniques. Research of available data collected by the multiple transducers indicates available industry data can be used to differentiate between RVHPs that are leaking through the interference fit area and those that are not leaking. DNC will continue to evaluate available volumetric examination techniques that can provide an assessment of the material surrounding the RVHP. A successful performance demonstration would be required of any new ultrasonic (UT) examination technique.

We plan to perform NDE examinations during the refueling outage that starts in February, 2002. We are currently determining the appropriate sample size of RVHPs necessary to inspect to assure that potential cracks are detected and repaired. Our sampling technique is being derived using conservative and commonly accepted statistical approaches along with the available nozzle crack probabilities.

- b. The regulatory requirements cited in Bulletin 2001-01 are a number of the General Design Criteria (GDC) (Appendix A to 10 CFR 50), 10 CFR 50.55a and three of the criteria of Appendix B to 10 CFR 50. The above proposed examinations of the RVHPs and associated J welds will meet the regulatory requirements as follows:

GDC 14 states that the reactor coolant pressure boundary shall be designed, fabricated, erected and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. The subject penetrations are made from Alloy 600 which has a high fracture toughness and excellent overall corrosion resistance. The inspections to be performed will detect potential flaws which could lead to leakage. Identified flaws which could lead to Pressure Boundary leakage will be evaluated and repaired as appropriate.

GDC 31 states that the probability of rapidly propagating fracture of the reactor coolant pressure boundary be minimized. The inspections to be performed will verify that upon return to service the possibility of a crack to rapidly propagate to failure has been minimized.

GDC 32 states that, "components which are part of the reactor coolant pressure boundary shall be designed to permit (1) periodic inspection and testing of important areas and features to assess their structural and leak tight integrity, and (2) an appropriate material surveillance program for the reactor pressure boundary." The previous performance of eddy current testing shows that the penetrations at Millstone Unit No. 2 have been designed so that a periodic inspection of the penetration can be done. This UT inspection is specifically designed to assess the structural and leak tight integrity of this joint by looking for cracking in the full volume of the penetration. Hence GDC 32 is being met.

10 CFR 50.55a states that ASME Class 1 components, which include the RVHP nozzles, must meet the requirements of Section XI of the ASME B&PV Code. The proposed volumetric examinations to be performed are beyond the minimum 25% visual examination with the insulation in place required by the Inservice Inspection Program. Flaws identified will be evaluated in accordance with the rules for austenitic piping contained in Section XI. Therefore the requirements of 10 CFR 50.55a are being met.

The three criterion of Appendix B which are discussed in Bulletin 2001-01 are V, IX and XVI.

Criterion V states that activities affecting quality shall be prescribed by documented instructions, procedures or drawings, of a type appropriate to the circumstance and shall be accomplished in accordance with these instructions, procedures or drawings. Criterion V further states that instructions, procedures or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

All the inspections and any repairs to the reactor vessel head penetrations will be done according to procedures that will be appropriately reviewed and approved. Since the inspections and any repairs would be to the primary coolant boundary, these procedures will have a similar level of detail as those for the inspection of steam generator tubing. Therefore, Criterion V is being met.

Criterion IX of Appendix B to 10 CFR Part 50 states that special processes, including NDE testing, shall be controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria and other special requirements.

All inspections will be done using personnel who are qualified in the NDE discipline being used. The qualifications of these personnel will be reviewed by the Millstone

Level III qualified individuals for the appropriate NDE technique. These personnel shall have demonstrated proficiency on the NDE techniques that will be used. In particular, those performing the UT examinations will have demonstrated their ability to identify the types of flaws of interest in the RVHPs. The other UT techniques under development shall have demonstrated their ability to find the types of flaws of interest. A performance demonstration of these new techniques will be completed prior to the start of the refueling outage.

Criterion XVI of Appendix B to 10 CFR Part 50 states that measures shall be established so that conditions adverse to qualify are promptly identified and corrected.

Should cracking or leaking penetrations/welds be determined as part of these examinations, additional NDE will be done to confirm initial findings. These actions will characterize the flaw. Once characterized, the flaw(s) will be removed or repaired with an ASME or NRC approved methodology. These actions meet Criterion XVI of Appendix B to 10 CFR Part 50.

NRC Bulletin 2001-01, Question 5:

*5. Addressees are requested to provide the following information within 30 days after plant restart following the next refueling outage:*

- a) 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;*
- b) 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.*

Millstone Unit No. 2 Response

5. Millstone Unit No. 2 will provide the requested information within 30 days following restart from the next refueling outage.