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Dominion

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U. S. Nuclear Regulatory Commission
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DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
2005 STEAM GENERATOR TUBE INSPECTIONS

On November 21, 2007, the NRC requested additional information related to the 2005 annual Steam Generator tube inspection report, which covers inspection activities in the tenth refueling outage (3R10) at Millstone Power Station Unit 3.

The attachment to this letter provides the information requested.

Should you have any questions about the information provided or require additional information, please contact Mr. William D. Bartron at (860) 444-4301.

Sincerely,

J. Alan Price
Site Vice President - Millstone

Attachments: (1)

Commitments: None

cc: See next page

A001
NRR

cc: U.S. Nuclear Regulatory Commission
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ATTACHMENT

<u>2005 STEAM GENERATOR TUBE INSPECTIONS</u>

<u>RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION</u>

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3

2005 STEAM GENERATOR TUBE INSPECTIONS

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

On November 21, 2007, the NRC requested additional information related to the 2005 annual Steam Generator tube inspection report for the tenth refueling outage (3R10) at Millstone Power Station Unit 3 (MPS3). Dominion Nuclear Connecticut, Inc. (DNC) correspondence regarding these inspection activities includes the DNC letters dated October 2, 2006 and October 26, 2005 (ADAMS Accession Nos. ML062860044 and ML053070547).

The additional information requested is provided in the balance of this attachment.

NRC Question No. 1

Of all the new anti-vibration bar wear indications found in SG 'A' and 'C', what was the maximum depth of wear recorded?

DNC Response

The maximum depth of previously unrecorded anti-vibration bar wear identified during 3R10 was 25%. This indication was recorded in Steam Generator 'C', tube number R50-C93.

NRC Question No. 2

You indicated that inspections were performed at six possible loose part locations during the outage. Please provide the scope and results of any other secondary side inspections (including foreign object search and retrieval) performed during the 2005 outage.

DNC Response

In addition to the inspections that were performed at six possible loose part locations, inspections at the top of tube sheet in Steam Generators 'A' and 'C' were performed in the no-tube lane and annulus areas. No degradation was identified. No additional loose parts were observed.

An inspection of the internal areas of the Steam Generator 'C' steam drum down to the seventh support plate was also conducted. All steam drum components viewed appeared structurally sound and in good condition, with the exception of J-Tubes numbers 1, 15, 16, and 30. These J-Tubes showed signs of erosion at the nozzle weld to header interface on the ID of the header. UT and weld repair (overlay) was performed on these nozzles during this outage, based on the inspection results.

Repairs to the same J-Tubes were also completed in Steam Generator 'B' during this outage and in Steam Generator 'D' during the previous refueling outage. J-Tube repairs in Steam Generator 'A' were completed subsequently during 3R11.

Mid deck and Intermediate deck components viewed appeared to be in good condition and functioning as designed. On the lower deck some leakage was observed at the riser barrel / down comer slip joint, as well as some minor roughness or pitting on the primary separators in the location of feedwater overspray. No significant loss of material to the primary separators was visually observed and conditions were similar to those observed during the previous inspection. The Anti-Vibration Bars (AVB's) appeared in good condition.

NRC Question No. 3

You indicated that 379 of the U-bends in rows one and two were inspected this outage. Please discuss the last time the remaining U-bends in rows one and two were inspected with a rotating probe. Please discuss the nature of the restrictions observed in the row one and row two tubes.

DNC Response

During 3R06, (1999), Millstone began performing rotating coil examinations on a sample of the row 1 and 2 U-bends, (50% of the row 1 and 2 U-bends were inspected with a rotating coil and the other 50% were inspected with a bobbin coil). During subsequent outages the sample alternated so that the 50% row 1 and 2 U-bends that had previously been examined with a bobbin coil technique were inspected with a rotating coil technique and the other 50% that had been previously examined with a rotating coil were examined with a bobbin coil.

All of the row 1 and 2 U-bends that were not examined with rotating coil techniques during 3R10 (2005), were last inspected during 3R08 (2002).

During 3R10, the acquisition team reportedly experienced more difficulty traversing the tight radius U-bends with the bobbin probe than with the rotating coil probe. Therefore, a decision was made to abort the bobbin coil sample and add the remainder of the bobbin coil sample to the rotating coil sample.

The difficulty in traversing these U-bends with the bobbin probes is assumed to be due to the coil design, (primarily due to the size of the bobbin coil probe), and not related to any change in tube geometry. The bobbin coil probe is larger in diameter and of a more rigid design than the rotating coil probes.

100% of the U-bends in rows 1 and 2 are scheduled to be examined with rotating coil techniques during all future MPS3 Steam Generator examinations.

NRC Question No. 4

You indicated that 1054 overexpansions were inspected this outage. Of the total population of overexpansions within the tubesheet, what percentage does the 1054 represent? What was the criterion used to determine which overexpansions were inspected (i.e., was it only the overexpansions whose voltage exceeded 28 volts)?

- Were the 1054 overexpansions contained within the 207 tubes identified in Table 1 of your October 2, 2006 letter?
- Given the requirements in place at the time of the inspection, what was the basis for only sampling overexpansions in the top 16 inches of the tubesheet?
- Given recent operating experience, that cracking can occur in and near the tube-to-tubesheet weld and the tack expansion, please discuss why no inspections were performed in this region.

DNC Response

There are 8,783 overexpansions in the four MPS3 Steam Generators. Of these, 3,260 overexpansions are located on the hot leg side of the tubesheet in the four Steam Generators. The 1,054 overexpansions examined with diagnostic techniques during 3R10 represent 32% of the total population of hot-leg overexpansions.

No evidence of cracking was observed at any of these locations or anywhere else in the Steam Generators.

Prior to the inspection, crack-like indications were reported in overexpansions at Catawba and Vogtle (none of which were confirmed by metallurgical evaluation). Millstone determined that it would be prudent to examine a sample of the overexpansion population for baseline data and to determine if the mechanism existed here. A sample of 200 tubes containing the overexpansions with the highest bobbin coil voltages were selected. This population included all overexpansions with bobbin coil voltages exceeding 28 volts. The remainder of the sample came from overexpansions with bobbin coil voltages between 18 and 28 volts, which were located in either the 200 tubes noted above or the tubes inspected in the roll transition region (50% of the tubes, top of tube sheet +/- 3 inches). Based on a review of relevant literature, Millstone identified that the greatest risk to tube integrity was associated with cracks located in the upper areas of the tube sheet. Thus, consistent with nuclear safety, this initial sample was focused on the upper region of the tube sheet. A 16-inch distance was selected as an appropriate depth for the initial round of inspections conducted during 3R10. Additional tubes and depth within the tubes would be inspected as required as sample expansions during the current outage or as required during subsequent refuel outages.

NRC Question No. 5

Please clarify the scope of your dent and ding inspections. In particular, were all dents and dings greater than or equal to five volts inspected with a rotating probe? If not, please clarify when the last time was that dents and dings greater than five volts were inspected with a rotating probe.

DNC Response

The locations of all previously reported hot-leg dent and ding indications are included in the pre-outage rotating coil examination scope for MPS3 Steam Generator inspections. (The hot-leg is defined as Tube End Hot (TEH) to 08H +2.00".) Additionally, during the bobbin coil examinations, all newly reported hot-leg dents and dings greater than or equal to 3.0 volts and any previously reported dent or ding indications that exhibit change from history are added to the rotating coil scope during each outage. For bobbin coil dent and ding indications, a change from history is defined as an indication that exhibits a departure (either an amplitude deviation greater than or equal to 0.5 volts or a phase angle discrepancy of greater than or equal to 10 degrees) from the previously recorded indication data obtained during the previous two examinations.

With all other variables being equal, (e.g. material susceptibility, chemical environment, stress levels), the temperature dependency of stress corrosion cracking makes it much more likely to develop in the highest temperature portions of the tube first. Therefore, rotating coil examinations are not performed on dent and ding locations other than those identified above.

NRC Question No. 6.

Table 2 indicated that tubes in SG 'A' at row 29 column 109 (R29C109) and R29C110 were visually inspected for loose parts. Both the map of SG 'A' and the associated table in Attachment 3 indicate R29C112 as having been inspected and not R29C109 and R29C110. Please clarify.

DNC Response

On the tube sheet, cold-leg side (TSC), Eddy Current Testing (ECT) reported a Potential Loose Part (PLP) at R30C108 (Attachment 3), and Single Volumetric Indications (SVIs) at R29C109 and R29C110 (Attachment 4). These locations as well as bounding tubes were inspected by rotating coil. As noted in Table 2, the area adjacent to these three tubes was visually inspected with no part identified. A magnet was drawn through the sludge deposits in the area and magnetic material was removed. The PLP signal associated with R30C108 disappeared.

On the flow distribution baffle, hot-leg side (01H), ECT reported Loose Part Removed (LPR) indications at R28C113 and R29C112 (Attachment 3) and an SVI indication at R28C112 (Attachment 4). These locations as well as bounding tubes were inspected by rotating coil. As noted in Table 2, the adjacent area was visually inspected and a two inch long piece of weld wire was located and removed.

NRC Question No. 7

Please clarify the following inspection categories from Table 1: "U-bends – Additional Scope (tubes)" and "U-bend. Special Interest – Diagnostic Exams and from Previous History (tubes)."

DNC Response

The "U-bend Special Interest – Diagnostic Exams and from Previous History (tubes)" were part of the pre-planned inspection scope. The "U-bends – Additional Scope (tubes)" were added to the inspection scope during the course of the outage.

NRC Question No. 8

Please clarify the nature of the single volumetric indications (SVIs) that were sized and left in service. If any of the indications are related to loose parts, please clarify whether a loose part or potential loose part is still at the affected location. If so, discuss the basis for leaving the tube(s) in service. In addition, please provide the depth estimate of all SVIs that were left in service. Please discuss whether any of these indications have changed in size since the last inspection.

DNC Response

The SVIs identified during this examination were determined to be the result of wear, either associated with foreign objects or due to mechanical wear caused by the sludge lancing mechanism employed in previous outages. There are no known loose parts or potential loose parts remaining at any of the SVI locations.

Of the 32 SVIs reported in Attachment 4 to the 2005 Annual Report, the depth estimates ranged from 9% to 35% Thru-Wall (TW). All SVIs were characterized using diagnostic (rotating coil) techniques. Twenty-one of the SVIs were sized during 3R8 or were sized during a review of 3R8 data. The maximum departure in depth from previous estimates was 4% and the average departure in depth from previous estimates was –1.4%. These variations from the previous measured depth estimates are attributed to factors such as probe wear, diametric offset of the probe, and sizing uncertainty. All of the 32 SVIs remain in service.