October 11, 2002

MEMORANDUM TO: James Clifford, Chief
Project Directorate Section I-1
Division of Licensing Project Management

FROM: A. Louise Lund, Chief ***/RA Cheryl Khan for/***
Component Integrity and Chemical Engineering Section
Materials and Chemical Engineering Branch
Division of Engineering

SUBJECT: SUMMARY OF CONFERENCE CALLS WITH NORTHEAST UTILITIES REGARDING THE 2002 STEAM GENERATOR INSPECTION RESULTS AT MILLSTONE UNIT 3 (TAC NO.: MB6183)

On September 18, 2002, the staff of the Materials and Chemical Engineering Branch, Division of Engineering, Nuclear Reactor Regulation, participated in a conference call with Northeast Utilities representatives regarding the ongoing steam generator tube inspection activities at Millstone Unit 3. Attached is a brief summary of the conference call. We ask that you make the summary publicly available. Please include myself, Bart Fu, Cheryl Khan, and David Lew on distribution for the final document. If you elect to change the attached summary, prior to sending to the licensee, please include me on concurrence. Upon issuance of the attached summary this TAC can be closed.

EMCB formally reviews all steam generator inspection summary reports submitted by licensees in accordance with the plant's technical specification requirements. The licensee's typically submit these summary reports within one year of the completion of the steam generator inspections. Therefore, please provide this report and a work request to me when it is submitted. The TAC number for this effort should be opened as a non fee-billable Other Licensing Task (OLT). The process for handling our review of steam generator inspection summary reports as well as the steam generator conference calls is outlined in the September 30, 2002 memo from Richard J. Barrett and John A. Zwolinski to Brian W. Sheron (ML022740514).

We appreciate your support in this matter.

Attachment: As stated

CONTACT: Z. Bart Fu, EMCB/DE
301-415-2467

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SUMMARY OF CONFERENCE CALLS

WITH

NORTHEAST UTILITIES

REGARDING THE SEPTEMBER 2002 STEAM GENERATOR INSPECTION RESULTS

AT MILLSTONE UNIT 3

The NRC staff participated in a conference call on September 18, 2002 with Northeast Utilities representatives regarding the ongoing steam generator (SG) tube inspection activities at Millstone Unit 3. Topics discussed during the conference call consisted of: background, initial eddy current testing scope, scope expansion plans, indications identified to-date, repair/plugging plans, new degradation findings, condition monitoring and operational assessment. At the time of the call, the licensee was approximately 76% complete with their inspections in SG A and 87% complete in SG C.

Background

Millstone Unit 3 is a four-loop Westinghouse pressurized water reactor with four Westinghouse Model F recirculating steam generators (A, B, C, D) with thermally treated Alloy 600 tubes, which are nominally 0.750 inch in diameter and have a nominal wall thickness of 0.043 inches. The tubes are hydraulically expanded for the full depth of the tubesheet at each end. The tubes are supported by a number of stainless steel tube support plates with quatrefoil shaped holes and V-shaped chrome plated Alloy 600 anti-vibration bars (AVBs). Prior to installation, the tubes in Rows 1 through 10 were treated in a furnace in order to relieve the stresses from bending the tubes.

Two modes of degradation have historically been observed in the Millstone Unit 3 steam generators: wear at the AVBs and wear from foreign objects.

Inspection Scope

During the September 2002 inspection, the licensee was using analysts and techniques qualified in accordance with the Electric Power Research Institute's (EPRI's) "PWR Steam Generator Examination Guidelines." Personnel were qualified to Appendix G of these guidelines and techniques were qualified to Appendix H.

The licensee planned to perform the following inspections in two of the four steam generators during the outage - SG A and SG C:

Full length bobbin examination of 100% of the inservice tubes.

Rotating probe (equipped with a plus-point coil) examination of 50% of the tubes from 3-inches above to 3-inches below the top of the hot-leg tubesheet. This examination would include the expansion transition.

ATTACHMENT

Rotating probe (equipped with a plus-point coil) examination of the U-bend region of 50% of the tubes in Rows 1 and 2.

Rotating probe (equipped with a plus-point coil) examination of all the dents/dings on the hot-leg side of the steam generator which have bobbin voltages greater than 3 volts.

Rotating probe (equipped with a plus-point coil) examination of all indication calls from bobbin probe inspection.

Visual examination of all tube plugs.

On the secondary side of the steam generator, the licensee planned to perform sludge lancing and foreign object search and retrieval (FOSAR) in each of the four steam generators.

Inspection Results

As indicated above, the inspections were approximately 76% complete in SG A and 87% complete in SG C on the day of the call. Based on the inspections performed, the following results were provided:

Wear at the AVBs

The licensee stated they plug all AVB wear greater than or equal to 37% through-wall (TW), and had detected 7 pluggable indications a the time of the call. The licensee detected 2 wear indications greater than or equal to 40% TW in SG A. One indication was detected greater than or equal to 40% TW in SG C. The maximum depth was 45% TW. Four indications were detected between 37% TW and 40% TW.

The licensee stated that the AVB wear growth rate is very low. Specifically, for flaws greater than or equal to 37% TW in all steam generators, the average growth rate is 6.5% TW per 2 cycles and the maximum rate is 10% TW per 2 cycles. For SG A, considering AVB flaws of all depths, the average growth rate is 1.3% TW in 2 cycles and the maximum rate is 13% TW in 2 cycles. The licensee stated that the calculated growth rate for SG C is even lower.

Wear from foreign objects:

The licensee detected a total of 7 possible loose part (PLPs) through eddy current testing most of which were located up to 4 inches above the tubesheet. One of these was located in a tube in SG A and 6 were located in tubes in SG C. The licensee planned to attempt to retrieve all loose parts.

One single volumetric indication (SVI)) was detected in SG A and 4 were detected in SG C. The licensee attributed these indications to wear due to loose parts. There was some correlation between the PLPs and the SVIs. The licensee stated that during this outage a new qualified sizing technique was used to depth size wear flaws caused by loose parts and that they intended to make plugging decisions based on the depth of the flaws.

Tube Repairs

The licensee plans to repair all tubes with AVB wear indications greater than or equal to 37% TW, all tubes with wear indications due to loose parts greater than 40% TW, and all tubes with cracks (if any are identified). Thermally treated Alloy 690 mechanical tube plugs will be used. For tubes with loose part wear indications less than 40%TW, the licensee does not plan to plug the tube if there is an associated loose part that can be removed. The bases for this approach is that 1) the flaw can be accurately depth sized; and 2) there would not be a driving force to further propagate the flaw. If a loose part can not be retrieved the licensee will perform an engineering evaluation to determine whether to plug the surrounding tubes.

Other

No new degradation mechanisms were identified to-date. The licensee was cognizant of the cracking indications identified at Seabrook and included the eddy current data from these indications in their site specific performance demonstration to train the eddy current analysts.

Ultrasonic testing was not planned for this outage, and based on the results to-date in-situ pressure testing and tube pulls were not needed. The licensee plans to follow industry guidelines to determine whether indications require an in-situ pressure test.

Based on the results to-date, the licensee indicated all tubes meet the structural and leakage integrity criteria and are projected to meet these criteria for the next two cycles (i.e., the next time the licensee plans to inspect SGs A and C).

NRC Observations

The NRC did not identify any issues with the scope or results of the examinations as a result of the information provided during the call. The NRC asked to be informed if any unusual findings (e.g., new degradation mechanisms, results not consistent with the above) were identified during the remainder of the inspections.

Additional Information

Following the completion of the conference call on September 18, the licensee updated the staff with respect to the SG inspection findings. They indicated that additional SVIs were identified, two of which exceeded a depth of 40%TW and would be plugged. The licensee concluded that these indications did not challenge the structural and leakage integrity performance criteria. Although the deepest SVI was identified with the bobbin probe, the majority of the SVIs were small and only detectible with a rotating probe. Therefore, the licensee decided to expand the scope of their SG tube inspections with a rotating probe in the region near the top of the tubesheet. They decided to inspect an additional 20% of the tubes on both the hot and cold leg side since wear due to loose parts is equally as likely to occur on the cold leg side as the hot leg side.

The NRC did not identify any issues with the expanded scope or results of the examinations and determined that additional follow-up was not necessary.