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LR-N03-0293

JUL 0 3 2003

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United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

SALEM UNIT 2 STEAM GENERATOR
TUBESHEET INSPECTION INFORMATION
SALEM GENERATING STATION UNIT NO. 2
FACILITY OPERATING LICENSE DPR-75
DOCKET NO. 50-311

In accordance with Nuclear Energy Institute (NEI) letter dated February 4, 2003, PROJECT NUMBER 689, NEI agreed to coordinate the response to questions regarding the performance of steam generator (SG) inspections at 15 PWRs, including Salem Unit 2, that may be susceptible to stress corrosion cracking within their steam generator tubesheet. Specifically the staff requested the following information:

1. The planned scope for the next steam generator inspection,
2. The basis for the inspection program within the tube sheet area, and
3. A description of the tubesheet inspection activities in the past.

The above subjects are addressed for Salem Unit 2 in the attachment to this letter. In addition, PSEG Nuclear expects to adopt the NEI Generic Steam Generator Technical Specification inspection requirements following the NRC acceptance of the generic license change package.

Should there be any questions regarding this submittal, please contact Mr. Courtney Smyth at (856) 339-5298.

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Subject: Salem Unit 2 Steam Generator Tubesheet Inspection Information

Background:

Salem Unit 2 steam generator tubes are installed into a 21 inch thick tubesheet, which is an ASME-SA508 Class 2 steel forging with Inconel cladding on the primary side. The tubing in the Salem Unit 2 steam generators was part-depth mechanically expanded (rolled) in the shop, and the Wextex process was a post-manufacturing, field-applied pre-service modification. The Wextex process was applied to Salem Unit 2 tubing to achieve full depth tube-to-tubesheet closure for both the hot and cold legs. The point where the tube transitions from expanded to the transition region is the BWT (Bottom of the Wextex Transition). Shot peening of the hot leg tubesheet region was performed during outage 2R8 (Fall 1994 - Spring 1995) to reduce the residual stresses as a preventive measure against Primary Water Stress Corrosion Cracking (PWSCC).

1. Planned Scope For The Next Salem 2 Steam Generator Inspection

Tubesheet inspection planning for outage 2R13 (October 2003) is similar to that performed during outage 2R12 and is summarized as follows:

- 100% of the in-service tubes in all four steam generators will be inspected full length with the bobbin coil with the exception of those tubes selected for inspection with rotating coil (+Point) through the low row U-bend region. For those tubes selected for low row U-bend +Point inspection, the bobbin probe will be limited to the area where +Point overlaps the bobbin inspection of the tube.

- 100% of the in-service hot leg tubesheet will be inspected using rotating coil probes (+Point) down to 8 inches below the top of the tubesheet.

2. Basis For Inspection Program Within The Tubesheet Area

The bobbin inspection described above satisfies the Technical Specification (TS) 3/4.4.6 inspection requirements in the tube sheet area. In addition to the inspections required by TS, PSEG Nuclear utilizes rotating coil probe inspections to ensure that the portion of the tube within the tubesheet that has a safety function can perform that safety function under normal and accident conditions. Although Salem Unit 2 has not docketed and does not employ any tubesheet Alternate Repair Criteria, WCAP-14797, Rev. 1 "Generic W* Tube Plugging Criteria for 51 Series SG Tubesheet Region WEXTEX Expansions" is used for guidance to determine what portion of the tube has a safety function, and the inspection depth is determined accordingly. WCAP-14797, Rev. 1 establishes a minimum required length of non-degraded expanded tubing in the tubesheet region that would provide structural and leakage integrity for postulated circumferential degradation that results in a complete separation of the tube below the required length. WCAP-14797, Rev. 1 also establishes the bases for the required depth of inspection for the +Point probe in the WEXTEX expanded portion of the tube below the expansion transition. Any degradation regardless of orientation below the depth established by WCAP-14797, Rev. 1 would not have an adverse affect on the structural and leakage integrity, and as such would not affect the safety function of the steam generator.

WCAP-14797, Rev. 1 further establishes varying depths below the BWT for pressure and leakage boundary integrity dependent upon tube location across the tubesheet. Salem Unit 2 utilizes the conservative depth of 7.5 inches below BWT as the inspection depth by +Point technique in order to be able to assess structural and leakage integrity. Since the inspection depth is measured from the top of the tubesheet on the secondary side, the minimum +Point inspection extent was conservatively established as 8 inches below the hot leg top of tubesheet to account for BWT and ECT measurement uncertainty. WCAP-14797, Rev. 1 identified BWT uncertainty as approximately 0.25 inches, and the ECT uncertainty as 0.12 inches. During outage inspections, tubes with identified indications within the tubesheet have the actual measured BWT reviewed against the inspection extent and non-degraded portion of tube for compliance with the WCAP methodology.

The determination of the required non-degraded expanded tube length within the tubesheet region described in WCAP-14797, Rev. 1 is conservative for the expected conditions within the Salem Unit 2 steam generators. The inputs and assumptions used in generic WCAP-14797, Rev. 1 bound the design and operating conditions of the Salem Unit 2 steam generators. Therefore, the defined required non-degraded tube lengths of WCAP-14797, Rev. 1 form a conservative basis for the structural and leakage boundaries for the tubing below the expansion transitions.

The WCAP-14797 Rev. 1 methodology is used at Salem Unit 2 only for determination of the appropriate tubesheet region inspection depth using rotating coil probes. Alternate repair criteria are not utilized; all degradation identified from either the bobbin coil or +Point examinations in the tubesheet region of the tube bundle is plugged upon detection. Thus, upon completion of the above-described examinations, technical specification compliance and structural and leakage integrity are assured.

3. Description Of Tubesheet Inspection Activities In The Past

The most recent steam generator inspection activities were performed during outage 2R12 (Spring 2002). Hot leg tubesheet inspections performed during outage 2R12 used bobbin coil and rotating coil (+Point) probes. 100% of the in-service tubes were inspected full length with the bobbin coil with the exception of those tubes selected for inspection with rotating coil through the low row U-bend region (i.e. 100% of row 2 and the 20% of row 3 population). The bobbin coil examination ensures compliance with Technical Specification surveillance requirements.

Rotating coil probes (+Point) were used in the hot leg tubesheet region to a depth (8 inches) that ensured that each tube is capable of performing its safety function. The +Point techniques are qualified in accordance with Appendix H of the Electric Power Research Institute PWR Steam Generator In-service Inspection Guidelines and provide adequate detection capabilities for both axial and circumferential degradation in this region of the tube bundle. The +Point examination base scope below the hot leg top of tubesheet was limited to that portion of the tube that can be demonstrated to provide adequate pressure and leakage boundary capabilities.