

November 9, 2007

Mr. Jim Riley, Director
Engineering
Nuclear Energy Institute
1776 I Street, NW Suite 300
Washington, DC 20006-3708

SUBJECT: STEAM GENERATOR INSPECTION REQUIREMENTS

Dear Mr. Riley:

By letter dated September 13, 2007 (ML072600574), you requested clarification on the acceptability of specific aspects of a plant's steam generator tube inspection program. These inspection programs were developed to meet the requirements contained within the technical specifications. Enclosed is the requested clarification.

It is our plan to document the Nuclear Regulatory Commission's staff position on the issues discussed in the attached in a Regulatory Issue Summary.

If you have any questions concerning this matter, please contact Ken Karwoski at (301) 415-2752.

Sincerely,

/RA/

Catherine Haney, Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Enclosure:
Steam Generator Inspection Requirements

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ADAMS Accession No.: ML073110083

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Steam Generator Inspection Requirements

All pressurized water reactors have adopted new steam generator (SG) tube inspection requirements in the last few years. These new requirements are modeled after Technical Specification Task Force (TSTF) Traveler 449 (TSTF-449), "Steam Generator Tube Integrity." The revised technical specifications are performance-based because they focus on ensuring the tubes satisfy performance criteria that are commensurate with assurance of adequate tube integrity.

The inspection requirements for SG tubes in TSTF-449 depend on the tube material and the heat treatment these tubes received. The requirements are conceptually very similar for the three types of tube material and heat treatment used in the United States. The pertinent Technical Specification inspection requirements for units with thermally treated Alloy 600 tubes are as follows (there are minor differences in these requirements for units with other tube materials and heat treatments):

- d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet, and that may satisfy the applicable tube repair criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. An assessment of degradation shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.
 1. Inspect 100% of the tubes in each SG during the first refueling outage following SG replacement.
 2. Inspect 100% of the tubes at sequential periods of 120, 90, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. In addition, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the refueling outage nearest the end of the period. No SG shall operate for more than 48 effective full power months or two refueling outages (whichever is less) without being inspected.
 3. If crack indications are found in any SG tube, then the next inspection for each SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever is less). If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack

As the industry began to implement the new technical specification inspection requirements for steam generator tubes, several questions/issues arose concerning acceptable approaches for implementing these new requirements. Each of these questions/issues is discussed below.

Issue 1: A new potential degradation mechanism may be identified at a plant after the first inspection in a sequential period. If this occurs, what are the expectations concerning the scope of examinations for this new potential degradation mechanism for the remainder of the period (e.g., do 100% of the tubes have to be inspected by the end of the period or can the sample be pro-rated for the remaining part of the period)?

The technical specification requirements contain a mixture of prescriptive and performance-based elements. Paragraph "d" of these requirements indicate the inspection scope, inspection methods, and inspection intervals shall be such to ensure that SG tube integrity is maintained until the next SG inspection. This element is performance-based since it describes the goal of the inspections, but does not specify how to achieve the goal. However, paragraph "d.2" is prescriptive since it specifies that 100-percent of the tubes must be inspected at specified periods.

In the event that an assessment of degradation performed after the first inspection in a sequential period results in a licensee concluding that a new degradation mechanism (not anticipated during the prior inspections in that period) may potentially occur, the scope of inspections in the remaining portion of the period should be sufficient to ensure tube integrity for the period of time between inspections.

In addition, to satisfy the prescriptive requirements of paragraph "d.2" that 100-percent of the tubes must be inspected within a period, a pro-rated sample for the remaining portion of the period is appropriate for this potentially new degradation mechanism. This pro-rated sample should be such that if it had been implemented at the beginning of the period, the technical specification requirements for the 100-percent inspection in the entire period (for this degradation mechanism) would have been met. A pro-rated sample is appropriate since (1) the prior inspections in this sequential period would have been performed consistent with the requirements and (2) the scope of inspections must be sufficient to ensure that tube integrity is maintained for the period of time between inspections.

Issue 2: The starting point for the first sequential period is clearly specified in the technical specifications. What is the starting point for the second and subsequent periods (i.e., after the accumulation of the effective full power months listed in the technical specifications or at the end of the last inspection in the previous period)?

The technical specifications indicate that the first sequential period begins after the first inservice inspection of the steam generators. The starting point for the first sequential period was after the first inservice inspection of the steam generators since the scope of the first inservice inspection is specified in the technical specifications as 100-percent of the tubes. The starting point for the second and subsequent periods shall be after the accumulation of the effective full power months listed in the technical specifications.

Issue 3: Can the refueling outage nearest the mid-point of the period occur after the mid-point of the period? Similarly can the refueling outage nearest the end-point of the period occur after the end-point of the period?

The inspection nearest the mid-point of the period can be on either side of the midpoint; however, the inspection at the end of the period must take place during an outage before the end of the period since the technical specifications clearly indicate the scope of examinations that must be performed within the specified periods.