

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

March 17, 1998

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No. 97-738
NL&OS/MWH R1
Docket No. 50-280, 281
50-338, 339
License No. DPR-32, 37
NPF-4, 7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
NORTH ANNA POWER STATION UNITS 1 AND 2
NRC GENERIC LETTER (GL) 97-05: STEAM GENERATOR
TUBE INSPECTION TECHNIQUES

On December 17, 1997, the Nuclear Regulatory Commission issued NRC Generic Letter 97-05, "Steam Generator Tube Inspection Techniques." The generic letter requested that licensees provide the following information: (1) whether it is the licensee's practice to leave steam generator tubes with indications in service based on sizing, and (2) if tubes are left in service with indications, submit a written report that includes the type of tube indication, nondestructive examination method used and the technical basis for the acceptability of the technique used.

Virginia Electric and Power Company's response is provided in Attachment A.

No Commitments are being made in this letter. Should you have any questions, please contact me.

Very truly yours,



James P. O'Hanlon
Senior Vice President - Nuclear

Attachment

ADD 1/1



ADD: AL DROMELICK

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Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

Mr. M. J. Morgan
NRC Senior Resident Inspector
North Anna Power Station

Attachment A
GL 97-05: "STEAM GENERATOR TUBE INSPECTION TECHNIQUES"
Virginia Electric and Power Company

RESPONSE TO REQUESTED INFORMATION FROM LICENSEES - SURRY AND NORTH ANNA
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ITEM (1)

Item (1) of GL 97-05 reads:

"whether it is their practice to leave steam generator tubes with indications in service based on sizing"

Response:

It is Virginia Electric and Power Company's (Virginia Power) practice for the Surry and North Anna units to disposition only volumetric type indications [i.e. anti-vibration bar(AVB) wear, fretting/mechanical wear, and pitting] by bobbin probe sizing techniques and to determine whether the respective tube will be plugged or remain in service until the next inspection. Except for indications at AVB's, rotating pancake coil(RPC) testing is performed to characterize the other referenced volumetric indications. Other types of indications [i.e. manufacturing buff marks, dings, and local geometric variations] are typically dispositioned by a combination of bobbin and RPC history data. These signals are typically not assigned a through wall depth since they have proven to be benign signals through removed tube exams and other in-situ supplemental testing such as ultrasonic testing at our Surry unit. No indications of a crack-like nature have been observed during either station's inspections to date and therefore, none are known to remain in service.

The sizing techniques used provide the necessary means to comply with the Technical Specification repair limit value of 40% through wall (TW). It is Virginia Power's current policy to plug AVB and suspected pit indications at greater than or equal to 30% TW and evaluate growth rates of such indications less than 30%. This is a conservative approach since both Surry and North Anna units are operating with replacement steam generators, Model 51F (600 Thermally Treated tubing) and Model 54F (690 Thermally Treated tubing) respectively.

Attachment A
GL 97-05: "STEAM GENERATOR TUBE INSPECTION TECHNIQUES"
Virginia Electric and Power Company

RESPONSE TO REQUESTED INFORMATION FROM LICENSEES - ITEM (2)
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Item(2) of GL 97-05 reads:

"if the response to item (1) is affirmative, those licensees should submit a written report that includes, for each type of indication, a description of the associated nondestructive examination method being used and the technical basis for the acceptability of the technique used".

Response:

Background

The nuclear power industry recently voted to adopt an initiative requiring each utility to implement the guidance provided in NEI 97-06, *Steam Generator Program Guidelines*, no later than the first refueling outage starting after January 1, 1999. As specified in NEI 97-06, each utility is required to follow the inspection guidelines contained in the latest revision of the EPRI *PWR Steam Generator Examination Guidelines* which in turn includes guidelines for qualification of various inspection techniques in Appendix H.

Appendix H, "Performance Demonstration for Eddy Current Examination," of the *PWR Steam Generator Examination Guidelines*, Revisions 3 through 5, provides guidance on the qualification of steam generator tubing examination techniques and equipment used to detect and size flaws. Damage mechanisms are divided into the following categories: thinning, pitting, wear, outside diameter intergranular attack/stress-corrosion cracking (IGA/SCC), primary-side SCC, and impingement damage for qualification.

For qualification purposes, test samples are used to evaluate detection and sizing capabilities. While pulled tube samples are preferred, fabricated samples may be used. If fabricated test samples are used, the samples are verified to produce signals similar to those being observed in the field in terms of signal characteristics, signal amplitude, and signal-to-noise ratio. Samples are examined to determine the actual through wall defect measurements as part of the Appendix H qualification process.

The procedures developed in accordance with Appendix H specify the essential variables for each procedure. These essential variables are associated with an individual instrument, probe, cable, or particular on-site equipment configurations. Additionally, certain techniques have undergone testing and review to quantify sizing performance. The sizing data set includes the detection data set for the technique with additional requirements for number and composition of the grading units.

Attachment A
GL 97-05: "STEAM GENERATOR TUBE INSPECTION TECHNIQUES"
Virginia Electric and Power Company

Generic Nondestructive Examination Sizing Techniques

The following sizing techniques are used during steam generator inspections to form a basis for leaving or repairing a tube with flaws in service. Sizing of identified degradation during the conduct of the examinations is currently permitted under the requirements of the specific plant applicable editions of Sections XI and V of the ASME Code and Regulatory Guide 1.83 to establish appropriate plugging and design structural limits for steam generator tubing. The basis for qualification of these referenced sizing techniques is contained in Appendix H of the EPRI *PWR Steam Generator Examination Guidelines*. Additional support for sizing degradation-specific mechanisms is provided under the Appendix H qualification database.

1. Wear

For wear at anti-vibration bars, sizing is accomplished using the 400/100 differential mix of the bobbin probe. A calibration curve for vertical amplitude maximum is determined based on the applicable standards replicating the damage mechanism type and quantity. The calibration curve must represent the full range of expected depths.

This sizing qualification is based on 64 sample data points. The samples ranged in depth from 4% to 78% through wall depth.

2. Pitting

For pitting, the 400/100 kHz mix of the bobbin probe is used to size the depth of the pit. A calibration curve is established using the 20%, 60% and 100% holes of the ASME calibration standard. Pit depth is called off the maximum rate of change from the appropriate mix.

The sizing procedure is based on the analysis of 65 sample data points. The sample pits ranged in depth from 19% to 81%.

Virginia Power Specific Applications:

In accordance with Appendix H guidelines, AVB wear is sized with a bobbin probe eddy current technique. The sizing technique uses a voltage curve that is established on wear scars on the calibration standard. The sizing curve is established on the 0%, 20%, and 40% points which is appropriate for the range of indications typically observed to date.

Suspected pit indications are characterized with an RPC probe to confirm they are volumetric in nature. Sizing is performed by the bobbin eddy current probe. The sizing

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Suspected pit indications are characterized with an RPC probe to confirm they are volumetric in nature. Sizing is performed by the bobbin eddy current probe. The sizing technique uses a phase angle curve that is established on drilled holes on the calibration standard. The sizing curve is established on the 20%, 60%, and 100% points.

Technical Basis for Acceptability of the Technique:

AVB wear and pit indications are sized in accordance with industry qualified techniques contained in the EPRI PWR Steam Generator Examination Guidelines, Appendix H for the bobbin probe.

Virginia Power considers the AVB wear sizing technique used for our units to be valid up to 50% TW. The nature of the suspected pit indications is confirmed with an RPC probe with appropriate sizing made with the bobbin probe. Virginia Power has employed a conservative tube plugging policy as indicated above. To date based on outage plugging evaluations, the largest as measured AVB wear indication that remains in service is on Surry Unit 2 and was a 24% TW indication exhibiting low growth when inspected in 1996. The largest volumetric (i.e., pit-like) indication remaining in service is on Surry Unit 2 and was a 27% TW indication exhibiting no growth when inspected in 1995.

No flaw-type indications have been observed during inspections on North Anna Units 1 and 2 steam generators since their replacement in 1993 and 1995, respectively.

Based on the use of industry accepted techniques for sizing the referenced indications, no concern exists regarding the acceptability of these tubes for continuing service until their next inspection.