TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

5N 157B Lookout Place

JAN 24 1990

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) - NRC BULLETIN 88-02, RAPIDLY PROPAGATING FATIGUE CRACKS IN STEAM GENERATOR TUBES

Reference: NRC letter to TVA dated November 29, 1989, "Request for Information, NRC Bulletin 88-02 (TAC Nos. R00328/67323 and R00329/67324) - Sequoyah Nuclear Plant, Units 1 and 2"

In response to the referenced letter, the enclosure provides TVA's reply to NRC's questions. This response was discussed with Emmett Murphy, of your organization, on January 4 and 9, 1990.

No commitments are contained in this submittal. Please direct questions concerning this issue to K. S. Whitaker at (615) 843-6172.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

M. J. Ray for

Manager, Nuclear Licensing
and Regulatory Affairs

Enclosure
cc: See page 2

IE13
1/1

U.S. Nuclear Regulatory Commission

JAN 24 1990

cc (Enclosure):
Ms. S. C. Black, Assistant Director
for Projects
TVA Projects Division
U.S. Nuclear Regulatory Commission
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Atlanta, Georgia 30323

NRC Resident Inspector
Sequoyah Nuclear Plant
2600 Igou Ferry Road
Soddy Daisy, Tennessee 37379

ENCLOSURE

WESTINGHOUSE LETTER

TVA-90-523

Westinghouse Electric Corporation
Energy Systems
Box 355
Pittsburgh Pennsylvania 15230-0355

Mr. P. G. Trudel
Sequoyah Project Engineer
Tennessee Valley Authority
Sequoyah Nuclear Power Plant, DSC-A
PO Box 2000
Soddy Daisy, TN 37379

TVA-90-523
January 11, 1990

Tennessee Valley Authority
Sequoyah Nuclear Power Plant
Response to NRC Questions - TVA

Dear Mr. Trudel:

The attached text material summarizes responses to NRC questions regarding the '88-02' analysis for Sequoyah Units 1 and 2. These responses were jointly developed between TVA and Westinghouse personnel during meetings held at the Westinghouse Energy Center January 3 and 4, 1990; and in subsequent telecons between T. A. Pitterle, D. Goetcheus, and Emit Murphy (NRC) Jan. 4, 1990. The responses also incorporate changes in text developed to support the telecon between TVA and Emit Murphy Jan. 9, 1990.

We trust TVA will find the attached consistent with recent discussions. Please advise Westinghouse if there are questions.

Very truly yours,

WESTINGHOUSE ELECTRIC CORPORATION

for B. J. Garry, Manager
TVA Sequoyah Project
Customer Projects Department

cc: D. Goetcheus, 1L, 1A
D. M. Lafever, 1L, 1A
R. Smith, 1L, 1A
R. Davis, 1L, 1A
M. Hodge, 1L, 1A

Attachment 1: Response to the Request for Additional Information relating to WCAP-12289, (Sequoyah Unit 1 Writeup)

1. *"...Were these plots the only information provided to Westinghouse concerning the AVB insertion depths?"*

Response: In addition to providing Figures 6-2 through 6-5, TVA had numerous discussions with Westinghouse regarding the technique involved in establishing the AVB locations. The TVA graphical projection method provides a physical representation of the AVB projection measurements, and was determined to provide the same level of accuracy as the Westinghouse arithmetic AVB projection methodology.

a. *"Were 'projection' measurements provided (such as those given in Figures 6-6 through 6-9)?"*

Response: The AVB maps provided in figures 6-2 through 6-5 are based on the graphical projection method (above). These maps show the AVB centerline insertion distance and are based on the best estimate values. Where inconsistencies are apparent in the eddy current data the structurally conservative 'minimum AVB insertion distance' interpretation is used.

b. *"Was information concerning the uncertainties associated with the projection measurements communicated to the Westinghouse personnel who estimated flow peaking factors?"*

Response: The AVB maps are based on eddy current calls from multiple tubes within each column. These were plotted to establish AVB projection depths and to segregate the AVBs on the right and left sides of each tube. Communication between TVA and Westinghouse provided adequate information to conservatively assess the flow peaking. The flow peaking assessment selectively considered variations in AVB insertion distance relative to the values mapped in figure 6-2 through 6-5 so as to maximize the flow peaking potential for the various locations.

To further confirm the conservatism of the Sequoyah Unit-1 evaluation, fourteen tubes were selected for re-evaluation based on their potential sensitivity to flow peaking. This evaluation was performed jointly by TVA and Westinghouse personnel. The tubes evaluated were:

SG	Row	Column
1	10	44
	9	4
	8	34
	8	59
2	9	10
	9	84
	8	24
	8	35
3	9	60
	8	35
	8	60
4	9	91
	8	59
	8	60

These tubes were re-evaluated based on AVB placements which would produce "maximum flow peaking". All fourteen tubes continued to be acceptable.

Four, previously listed as unsupported, were identified as being supported. Tube R8C35 in SG-2 is an example of this. It had been listed as unsupported with a peaking factor of 1.37.

One tube out of the 14 was found to have less peaking when the AVB locations were reviewed. This tube, R10C44 in SG-1 had been identified for corrective action, and had been stabilized during the June 1988 outage. Although unsupported, the flow peaking value was reduced from 1.20 to 1.00.

Six of the 14 tubes showed no change in support condition or flow peaking.

Using the "maximum peaking" approach, three tubes were found to have the potential for increased flow peaking; but all remained below the allowable peaking limit and continued to be acceptable.

This 14 tube re-evaluation indicates that the methods described in WCAP-12289 are acceptable and that the critical tubes have been properly identified.

2. *"Are the AVB insertion plots in Figures 6-2 through 6-5 based on the position of the centerline of the AVB? (or are they based on the position of the bottom surface of the AVB?). Was the answer to this question known to the Westinghouse personnel who performed the flow peaking estimates?"*

Response: The AVB maps show the AVB centerline location. This information was provided to Westinghouse prior to the flow peaking evaluation.

3. *"Are the AVB insertion plots in Figures 6-2 through 6-5 based on the best estimate AVB insertion estimates, or do they reflect adjustments to account for AVB insertion uncertainties so as to yield conservative estimates of flow peaking factors?"*

Response: As noted above, the AVB maps show the best estimate AVB locations. Where inconsistencies are apparent in the eddy current data, the structurally conservative 'minimum AVB insertion distance' interpretation is used.

4. *"Please confirm that the following statement appearing on page 8-15 of WCAP-12289 is applicable to Sequoyah Unit-1. 'For AVB patterns leading to significant peaking factors, AVBs were positioned within uncertainties to maximize the flow peaking factor'."*

Response: The flow peaking assessment selectively considered minor AVB adjustments relative to the AVB maps in figure 6-2 through 6-5 so as to maximize flow peaking. As noted above, conservative consideration of the AVB locations was reconfirmed in the 14 tube re-evaluation.

Attachment 2: Response to the Request for Additional Information relating to WCAP-12289 (Sequayah Unit 2 Writeup)

"The staff requests...information be provided...to demonstrate that (tube R09/C35)...is acceptable for continued service."

Response: In response to the request for additional information regarding the evaluation of tube R09/C35 in Sequoyah Unit 2 SG 2, Westinghouse has performed a detailed re-evaluation of the AVB positioning used as the basis for the flow peaking model of that tube. (See Figure 1)

As a result of the re-evaluation, a new test geometry, now identified as configuration 8o (Figure 2) was identified as defining this geometry and tested in the air, cantilever model at the Westinghouse Science and Technology Center. The test results indicate that the critical velocity which triggers fluidelastic instability for this tube is approximately 25 ft. / sec. It should be noted that the critical velocity for R09C51 in North Anna Unit 1 is 8.9 ft. / sec. Based on these critical velocities, a flow peaking factor of 1.00 is obtained for tube R09/C35 of Sequoyah Unit 2, Steam Generator 2. This tube is acceptable for continued service.

Sequoyah Unit 2 SG 2

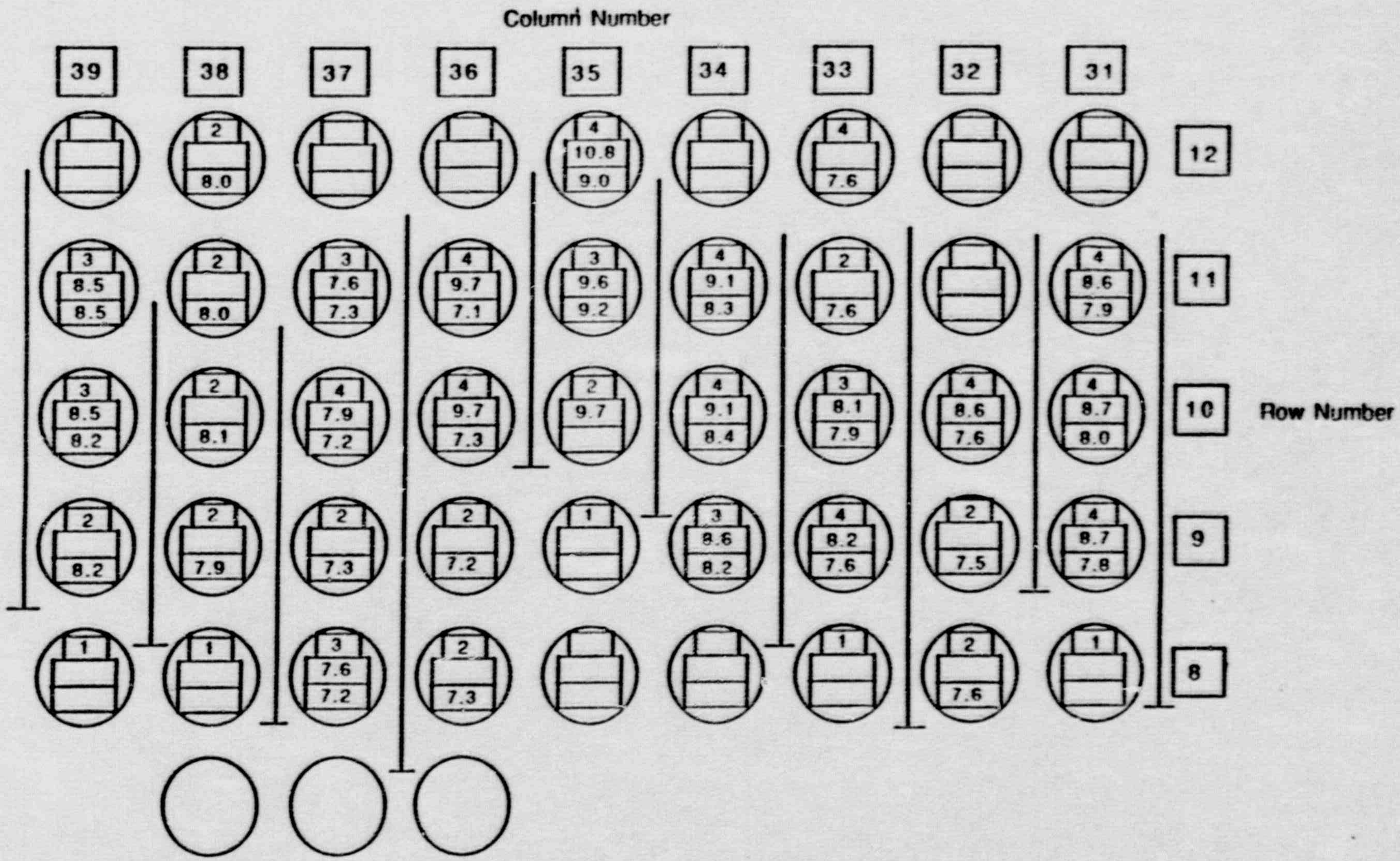

Figure 1

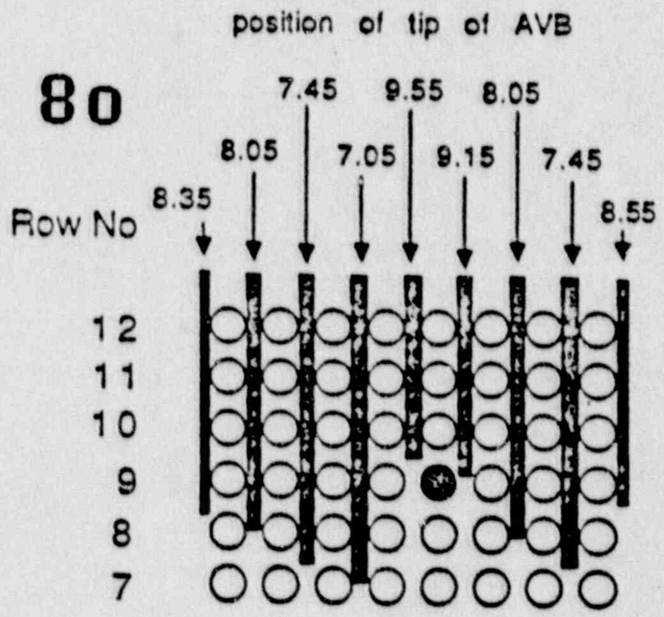
position of tip of AVB
8o
Row No
8.35
8.05
7.45
7.05
9.55
9.15
8.05
7.45
8.55
12
11
10
9
8
7

Figure 2