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TO: Mr Lear

FROM: Florida Power & Light Co  
Miami, Fla  
R E Uhrig

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10-26-76  
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DESCRIPTION

Ltr responding to our 10-21-76 request.....  
trans the following:

PLANT NAME: Turkey Point 3 & 4

ENCLOSURE

Info concerning program to assure the integrity  
of small bend radius tubes in steam generators  
which have experienced "denting".....

(43 cys encl rec'd)

**ACKNOWLEDGED**  
**DO NOT REMOVE**

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PROJECT MANAGER:	<i>Elliot</i>	PROJECT MANAGER:		
LIC. ASST.:	<i>Parrish</i>	LIC. ASST.:		

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HAT LAB: REG. VIE LA PDR CONSULTANTS To LA Parrish	



October 26, 1976  
L-76-369

# REGULATORY DOCKET FILE COPY

Office of Nuclear Reactor Regulation  
Attn: George Lear, Chief  
Operating Reactors Branch #3  
Division of Operating Reactors  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555



Dear Mr. Lear:

Re: Turkey Point Units 3 and 4  
Docket Nos. 50-250 and 50-251  
Steam Generator Inspection Program

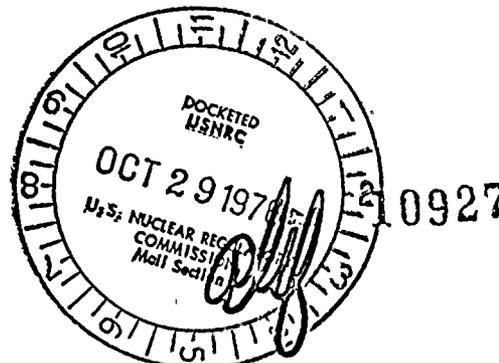
In response to your telephone request of October 21, 1976, concerning information on our program to assure the integrity of small bend radius tubes in steam generators which have experienced "denting," we have prepared a program which involves the cooperation of three other utilities and Westinghouse Electric Corporation.

The program will involve various inspections at six plant sites and is generally described in Attachment 1 to this letter. Attachment 2 describes details of each of the inspection plans, the information to be gained, and the application of the information to the overall program. Attachment 3 describes our detailed participation.

We will continue to keep NRC informed as information is obtained. Operation will not be resumed until after NRC concurs in the corrective action to be taken.

Very truly yours,

Robert E. Uhrig  
Vice President



REU/GDW/hlc

cc: Norman C. Moseley, Region II  
Robert Lowenstein, Esq.



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ATTACHMENT 1

As a result of the evaluation of Row 1 U-bend tubes removed from Surry Steam Generator 2-A, the program of action which follows was formulated by the involved utilities with the participation of the Westinghouse Electric Corporation. This program has three general objectives:

1. Establish whether or not the condition is confined to Surry Unit 2.
2. Verify the correlation between flow slot bowing and the change in ovalization of U-bend tubes as it relates to tube conditions observed at Surry Unit 2.
3. Define and implement a program that will assure the continued safe operation of the affected steam generators.

The proposed program consists of five separate types of inspections with appropriate evaluation as follows:

1. Handhole entry inspection of first tube support plate flow slots.
  - a. Visual
  - b. Photos/TV Camera
  - c. Measurement of Flow Slots
2. Upper bundle entry.
  - a. TV Camera/Videotaping
3. Eddy current probing in Rows 1 through 5 around U-bend to the extent possible.
4. Drilling 3-inch access opening at the top tube support plate.
  - a. Tube sample removal from Rows 1 (and if possible from Row 2)
  - b. Visuals/Photos
  - c. Measurement of Flow Slots
5. Tube pulling (through tubesheet). Removal of a leaky dent.

These inspections are more fully described in Attachment 2.

STEAM GENERATOR INSPECTION PROGRAM

	OCT	NOV	DEC	JAN	FEB	MAR
Turkey Point #3		Refueling 1, 2, 3				
Turkey Point #4		1, 2, 3, 4a, 4b, 4c				
Surry #1	Refueling 1, 2, 3, 5					
Surry #2				Reinspect 1, 2, 3		
Indian Point #2		3, 4b, 4c				
San Onofre			1, 2, 3			

1. Hand Hole Inspection
2. Topside Entry
3. Eddy Current
4. Inspection Port 3"
  - a) Tube sample removal
  - b) Visuals/photos
  - c) Measurement of flow slots
5. Tube Pulling

## ATTACHMENT 2

### STEAM GENERATOR U-BEND TUBE LEAKAGE

#### OVERALL INSPECTION PROGRAM

The inspections and field operations outlined in the following paragraphs are designed to provide that information necessary to answer the principal objectives of the program, viz.,

1. To establish whether or not the condition is confined to Surry Unit 2.
2. To establish the validity of correlation between flow slot bowing and the change in ovalization of U-bend tubes as it relates to the tube conditions observed at Surry Unit 2.
3. Define and implement a program that will assure the continued safe operation of the affected steam generators.

The first objective will be addressed by removing U-bend samples from a steam generator at another site to determine whether the tubes are in a similar condition to that found at Surry Unit 2. If so, the condition will be considered as potentially generic at other affected plants, depending upon the degree of distortion of the upper tube support plate flow slots, determined for each affected steam generator.

The data obtained from the additional U-bend samples will be supplemented by eddy current examinations to the extent possible at all affected sites in order to determine the condition of the narrow radius U-bends.

If the Surry Unit 2 condition is found in the additional U-bend samples, this data will add to that previously obtained to meet objective 2 above.

As part of a programmed field effort, it is planned to remove a straight length of steam generator tubing that has leaked at a dented region in order to determine the cause of that leakage. Any relationship between the U-bend conditions found at Surry Unit 2 and the leaking dented region should be established by this work.

The plant and steam generator selected for the additional U-bend samples will maximize the opportunity for determining if the U-bend conditions are potentially generic to the affected plants. Turkey Point Unit 4, Steam Generator B, has been selected since its condition appears most similar to Surry Unit 2, Steam Generator A.

If the condition found at Surry Unit 2 is not found in the U-bend samples removed from Turkey Point Unit 4, and distortion of flow slots is found equivalent to the distortion at Surry Unit 2, it may be concluded that the condition is not generic and possibly the result of a unique condition at Surry Unit 2. This conclusion may be supported by eddy current data analysis from other potentially affected steam generators.

Any remedial action to be taken at one or more steam generators must await the findings of the inspection program. Remedial action could include consideration of additional tube plugging in a pattern designed to limit the possibility for U-bend leakage as determined by the inspection findings.

Details of the individual inspection items are provided below:

Item 1: HANDHOLE INSPECTIONS

Access is provided into each end of the tubelane at a location between the tubesheet and the first tube support plate. The objective of the handhole inspection is to document the condition and dimensions of the support plate flow slots by TV videotape and photographic techniques. These techniques have been used previously and very good results have been obtained for the first (and sometimes second) tube support plate. This inspection will use high intensity lighting to attempt to view higher support plates. The dimensions of the lower plates will be correlated with the upper support plate dimensions for analysis and for future reference.

Item 2: TOPSIDE ENTRY INSPECTION.

Topside entry provides a means for determining the condition of the upper tube support plate. The inspection is intended to determine if distortion of the narrow radius U-bend tubes has occurred. This inspection requires entry through the upper shell manway and through the transition cone to reach the top of the tube bundle. Viewing the top support plate will be attempted by inserting a small TV camera, with videotape capabilities, into the tubelane. This requires that sufficient space be present between the tube bundle and the wrapper to permit entry of the TV camera and its orientation down the tubelane. If the required space is not available selected tubes may have to be removed to allow the camera's entry. The camera will record the tube support plate condition at the flow slots and dimensions for both flow slots and tube leg spacing will be determined from the videotape recordings.

Item 3: EDDY CURRENT TESTING

An eddy current inspection program will be implemented to the extent possible, to examine all tubes in Rows 1 through 5, through the U-bend. This inspection would be expected to supplement other observations of the condition of the tubing in this region.

Considerable difficulty has been experienced during previous inspections in passing a regular eddy current probe through small radius U-bends. The resulting eddy current signals have been noisy which lends more uncertainty to the findings than in the tube's straight length. To overcome these difficulties, laboratory calibration and technique refinement are presently in progress.

Item 4: THREE-INCH INSPECTION PORT

A three-inch inspection port will be installed in Steam Generator B at Turkey Point Unit 4, in steam generator A at Surry Unit 1, and in a steam generator at Indian Point Unit 2. These ports will permit visual and TV videotape records to be obtained at these plants.

At least nine tubes in Row 1 and, where practical, an equivalent number in Row 2 are planned to be removed from Turkey Point Unit 4 Steam Generator B and Surry Unit 1 Steam Generator A for subsequent examination. The tubes will be TIG cut just above the upper tube support plate. This permits removal of the entire U-bend plus several inches of straight length below the tangent point. This same technique and sample recovery was successfully utilized at Surry Unit 2, Steam Generator A in Row 1.

Item 5: TUBE PULLING FOR LEAKING DENT (One Sample)

To address the question of what causes leakage at some dented regions adjacent to the tube support plate, a straight length of tubing is planned to be removed from a steam generator at Surry Unit 1. This most likely candidate tube is in Row 3, Column 62 in the hot leg of Steam Generator A. The removal of this tube will be accomplished in the same manner as prior tube pulling operations. The sample will receive extensive laboratory examination to determine its cause of failure.



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FLORIDA POWER AND LIGHT COMPANY  
SPECIFIC INSPECTION PLAN

Florida Power and Light Company's specific plan for participation in the general program will consist of the following:

Turkey Point 4

1. Handhole entry into steam generators A, B, C
2. Bundle entry into steam generators A, B, C
3. Eddy current examination through U-bend Row 1 - 5, steam generators A, B, C
4. Drilling of 3" diameter access port at the top support plate on Steam Generator B and removal of tube samples; flow slot videotaping.

Turkey Point 3

1. Handhole entry into steam generators A, B, C
2. Bundle entry into steam generators A, B, C
3. Eddy current examination through U-bend Rows 1 - 5, steam generators A, B, C

The schedule for these items is shown on the integrated schedule provided in Attachment 1.

