

# CATEGORY 1

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9804060337      DOC. DATE: 98/03/26      NOTARIZED: YES      DOCKET #  
 FACIL: 50-250 Turkey Point Plant, Unit 3, Florida Power and Light C      05000250  
       50-251 Turkey Point Plant, Unit 4, Florida Power and Light C      05000251  
 AUTH. NAME      AUTHOR AFFILIATION  
 HOVEY, R.J.      Florida Power & Light Co.  
 RECIP. NAME      RECIPIENT AFFILIATION  
                   Document Control Branch (Document Control Desk)

SUBJECT: Forwards 90-day response to GL 97-06, "Degradation of SG Internals," issued 971230.

DISTRIBUTION CODE: A001D      COPIES RECEIVED: LTR 1      ENCL 1      SIZE: 11  
 TITLE: OR Submittal: General Distribution

**NOTES:**

	RECIPIENT ID CODE/NAME	COPIES LTTR	ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	ENCL
	PD2-3 LA	1	1	PD2-3 PD	1	1
	CROTEAU, R	1	1			
INTERNAL:	<u>FILE CENTER 01</u>	1	1	NRR/DE/ECGB/A	1	1
	NRR/DE/EMCB	1	1	NRR/DRCH/HICB	1	1
	NRR/DSSA/SPLB	1	1	NRR/DSSA/SRXB	1	1
	NUDOCS-ABSTRACT	1	1	OGC/HDS3	1	0
EXTERNAL:	NOAC	1	1	NRC PDR	1	1

C  
A  
T  
E  
G  
O  
R  
Y  
  
1  
  
D  
O  
C  
U  
M  
E  
N  
T

**NOTE TO ALL "RIDS" RECIPIENTS:**

PLEASE HELP US TO REDUCE WASTE. TO HAVE YOUR NAME OR ORGANIZATION REMOVED FROM DISTRIBUTION LISTS OR REDUCE THE NUMBER OF COPIES RECEIVED BY YOU OR YOUR ORGANIZATION, CONTACT THE DOCUMENT CONTROL DESK (DCD) ON EXTENSION 415-2083

TOTAL NUMBER OF COPIES REQUIRED: LTTR    13    ENCL    12





MAR 26 1998

L-98-60  
10 CFR 50.4  
10 CFR 50.54(f)

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

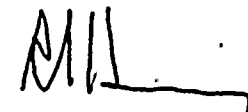
RE: Turkey Point Units 3 and 4  
Docket Nos. 50-250 and 50-251  
Generic Letter 97-06 Response

NRC Generic Letter (GL) 97-06, "Degradation of Steam Generator Internals," issued on December 30, 1997, required licensees to provide within 90 days, certain information to verify whether addressees' steam generator internals comply with and conform to the current licensing bases for their respective facilities.

The scope of the GL applies to steam generator internals and their potential for degradation as discussed in the GL. The purpose of the GL is to (1) again alert addressees to the previously communicated findings of damage to steam generator internals, namely, tube support plates and tube bundle wrappers, at foreign PWR facilities, (2) alert addressees to recent findings of damage to steam generator tube support plates at a U.S. PWR facility, (3) emphasize to addressees the importance of performing comprehensive examinations of steam generator internals to ensure steam generator tube structural integrity is maintained in accordance with the requirements of Appendix B to 10 CFR Part 50, and (4) require all addressees to submit information that will enable the NRC staff to verify whether addressees' steam generator internals comply with and conform to the current licensing bases for their respective facilities. The attachment to this letter provides the Florida Power and Light Company response to GL 97-06 for Turkey Point Units 3 and 4.

This response is provided pursuant to the requirements of Section 182a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f).

Very truly yours,

  
R. J. Hovey  
Vice President  
Turkey Point Plant

OIH

Attachment

cc: Luis A. Reyes, Regional Administrator, Region II, USNRC  
T. P. Johnson, Senior Resident Inspector, USNRC, Turkey Point  
Plant

9804060337 980326  
PDR ADDCK 05000250  
P PDR

STATE OF FLORIDA                     )  
  )  
COUNTY OF MIAMI-DADE             )       ss.

R. J. Hovey being first duly sworn, deposes and says:

That he is Vice President, Turkey Point Plant, for the Nuclear Division of Florida Power & Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

*RJH*

R. J. Hovey

STATE OF FLORIDA

COUNTY OF MIAMI-DADE

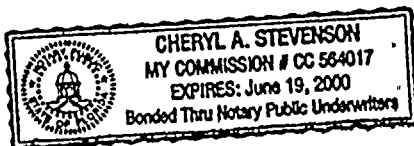
Sworn to and subscribed before me

this 26<sup>th</sup> day of March, 19 98

by R. J. Hovey, who is personally known to me.

*Cheryl A. Stevenson*

Name of Notary Public - State of Florida



(Print, type or stamp Commissioned Name of Notary Public)

GENERIC LETTER 97-06 RESPONSE

On December 30, 1997, the NRC issued Generic Letter (GL) 97-06, "Degradation of Steam Generator Internals," requiring licensees to provide within 90 days, certain information to verify whether addressees' steam generator internals comply with and conform to the current licensing bases for their respective facilities. In accordance with the GL, the Florida Power and Light Company (FPL) response to the requested information for Turkey Point Units 3 and 4 is provided below.

**Background**

Prior to issuance of the GL, the Westinghouse Owners Group, Electric Power Research Institute and Nuclear Energy Institute developed an action plan to assess the susceptibility of steam generators to secondary-side degradation. The Turkey Point Plant intends to follow the industry action plan as a supplement to our existing program for inspection of secondary side internals. Included in the industry plan is an assessment of the causal factors involved in the degradation experienced in foreign Units and discussed in the GL. This information is captured in EPRI report GC-109558, "Steam Generator Internals Degradation: Modes of Degradation Detected in EdF Units". This report was submitted to the NRC via NEI letter, dated December 19, 1997.

The Turkey Point Plant has Model 44F replacement steam generators. However, since Westinghouse Model 51 Series Designs are most similar to the EdF Units, the Westinghouse Owners Group has initially reviewed EPRI GC-109558 relative to the design of Series 51 steam generators, and determined limited potential susceptibility. This conclusion is documented in report WCAP-15002, Rev. 1, "Evaluation of EdF Steam Generator Internals Degradation - Impact of Causal Factors on Westinghouse 51 Series Steam Generators", December 1997.

WCAP-15002, Rev. 1, documents visual inspections of the plants. It is concluded that the number of plants that have been inspected, and the inspection results, demonstrate that the causal factors identified by EdF do not jeopardize the continued operability of Westinghouse Series 51 steam generators. Eddy current inspection of the tubes would detect any detrimental effects on the tubing due to wear caused by tube support plate (TSP) ligament degradation, loose parts, and secondary side flow distribution changes. Foreign object search and retrieval efforts are conducted to discover loose parts.

A Westinghouse Owners Group evaluation is planned for the remaining types of steam generators (Model 44F, F, D3, D4, D5 and E1/E2), which should be complete by June of 1998. The Turkey Point Plant program has included routine sludge lancing and secondary side foreign object search and retrieval (FOSAR) inspections at each refueling outage since 1984. Inspections of the steam separation and feedring equipment have typically been conducted since 1991. Recent inspections have included peripheral and internal areas of support plates and upper tube bundle regions. The latest industry guidance for inspection of secondary side internals, discussed below, will be considered for inclusion in the

Turkey Point Plant program and will be updated as appropriate based on industry and plant specific inspection experience.

**NRC Requested Information - Item 1**

*Discussion of any program in place to detect degradation of steam generator internals and a description of the inspection plans, including the inspection scope, frequency, methods, and equipment.*

**FPL Response**

The Turkey Point Plant has participated in a broad industry effort to evaluate domestic and foreign experience for degradation of steam generator internals components, and to assess the susceptibility of the Turkey Point Plant steam generators to these types of degradation. Westinghouse Owners Group evaluations have been completed to document inspection experience, and to assess the susceptibility of Westinghouse designs to the types of degradation observed. The results of the Westinghouse Owners Group inspection survey are summarized in Table 1.0 and discussed below. Additional Westinghouse Owners Group evaluations are due for completion in June of 1998, which will further assess the susceptibility of the Turkey Point design steam generators (Model 44F) to these types of degradation, and provide additional inspection recommendations. Turkey Point typically conducts routine inspections of secondary side internals in one or more steam generators at each outage. Table 2.0 provides a summary of the Turkey Point steam generator inspection results. Based on the favorable inspection results and industry performance of the Model 44F design installed at Turkey Point, and low susceptibility to the types of foreign and domestic degradation observed, no change is currently considered necessary in the Turkey Point program for inspection of secondary side internals. However, Turkey Point plans to follow the industry program as a supplement to our existing program, and implement changes, as appropriate, based on site specific inspections, and the results of industry inspection experience.

As discussed in WCAP-15002, Rev. 1, surveys were sent to Westinghouse Owner Group utilities requesting the results of secondary side inspections, and tube inspections for tube support plate conditions. Completed surveys were received for 37 of 49 plants. For units with feedrings and stainless steel support plates (Model 44F, F, D3, D4, D5 and E1/E2), responses were received for 12 plants. Of these, 11 responded as having inspected or reviewed inspection data for indications of tube support plate (TSP) ligament cracking, and 8 having performed SG secondary side entries that give confidence of not having wrapper drop.

The modes of degradation detected include cases of flow-assisted corrosion, or erosion-corrosion, and of premature cracking that results from either surface fatigue or from corrosion cracking that is associated with surface conditions such as pitting or geometric concentrations. However, the surveys do not report detection of the following modes of degradation experienced in the EdF Units:

- a. Significant material losses - post chemical cleaning
- b. Wrapper drop or misalignment
- c. TSP ligament cracking or thinning

During routine eddy current inspection in a Model D4 steam generator at one plant, tube wear indications believed to be caused by a foreign object were detected on several row 49 tubes just above the B plate, cold leg side. Upon examining the preheater water box area, two cylindrical objects were found and erosion/corrosion was observed on the vertical support ribs welded to the outside of the steam generator impingement plate in the water box area. This condition is relative to steam generators with preheaters, and does not directly affect Turkey Point.

In the Model D3 steam generator, visual inspection of the secondary tube sheet region at one plant in two steam generators showed that one end of the blow down pipe was severed. The separation occurred at the upper edge of the elbow to fillet weld on one of the two forged elbows located at the ends of the blow down pipe in each steam generator. The design of the blow down pipe for the Model D3 steam generator is unique in that other preheat steam generator designs do not utilize a continuous blow down pipe that extends the length of the tube lane. This condition was observed in preheater type units and does not directly affect Turkey Point.

The secondary side internal degradation types found in Westinghouse steam generators are identified in Table 1.0. The SG design in the Turkey Point Plant contains a feedring and stainless steel tube support plates.

**Table 1.0**  
**Secondary Side Internal Degradation Types In Westinghouse Design SGs**

Degradation Type	Steam Generator Design			
	Feeding Carbon Steel TSPs	Preheat Carbon Steel TSPs	Feeding Stainless Steel TSPs	Preheat Stainless Steel TSPs

**Erosion-Corrosion:**

Moisture Separator	X	S	X	S
Water Box	NA	X <sup>(4)</sup>	NA	S
TSP Flow Hole Ligaments	S	S	NA	NA
Feeding J-Tubes	X	NA	X	NA

**Cracking:**

TSP Ligaments <sup>(1), (2)</sup>	X	S	L	L
Wrapper Near Supports <sup>(2)</sup>	L	L	L	L
Transition Cone Girth Weld	X	L	X <sup>(3)</sup>	L

**Other:**

Wrapper Drop <sup>(2)</sup>	L	L	L	L
-----------------------------	---	---	---	---

X observed in some steam generators

S Susceptible

L Low Susceptibility

NA Not Applicable

(1) Various indications of possible tube degradation may be artifacts of manufacturing anomalies related to patch plate welds and drilling alignment.

(2) Various Westinghouse design features are beneficial relative to some steam generator design features of foreign manufactures.

(3) In SG replacements with the original shell not replaced.

(4) This mechanism does not apply to the Model D3 because of the Alloy 600 inlet manifold design used.





### Discussion of Inspection Results

A steam generator inspection summary for the Turkey Point Plant is included in Table 2.0 below.

**Table 2.0**  
**WOG Internal Degradation Program**  
**SG Inspection Summary for Turkey Point Plant**

Component	Location			Condition			Type of Inspection
	Row	Col	Elev.	Cracks	Missing	FAC <sup>(1)</sup>	
Tube Support Plates	Sample all TSPs in one SG each Outage			No	No	No	Video probe Video camera
	Lower	Upper	Seam	Cracks	Deform	Drop	
Wrapper	Sludge Lance each outage through openings in shell & wrapper.					No	Visual & Insertion of sludge lance equipment
	Shell	TSPs	Other	Pitting	Wastage	Cracks	
Chemical Cleaning	NA			NA			NA
				Pitting	Wastage	Cracks	
Other Secondary Side:	Replaced 1989/1990			No <sup>(2)</sup>	No	No	ASME Sec XI
Girth Welds				No	No	No	Visual
Feeding J-Tubes				No	No	No	Visual
Water Box				No	No	No	Visual
Riser Barrels				No	No	No	Visual
Tangential Nozzle				N/A	N/A	N/A	

(1) Flow Accelerated Corrosion

(2) Some surface roughness detected

The Turkey Point Plant program has included routine FOSAR inspections after sludge lancing at each refueling outage since 1984. Inspections of the steam separation and feeding equipment have typically been conducted at each outage since 1991. More recent inspections since 1994 have included peripheral and internal areas of support plates and upper tube bundle regions. Methods and equipment include direct visual and remote video using Welch Allyn probes and video cameras mounted on inspection carts and telescoping devices.



**NRC Requested Information Item 1 (a)**

*Whether inspection records at the facility have been reviewed for indications of tube support plate signal anomalies from eddy-current testing of the steam generator tubes that may be indicative of support plate damage, or ligament cracking. If the addressee has performed such a review, include a discussion of the findings.*

**FPL Response**

Cracking has not been reported in the stainless steel quatrefoil tube support design which is present in the Turkey Point Plant SGs, and it has a low susceptibility to corrosion. All eddy current inspections since 1990 have included 100% of active tubes in each steam generator. Since tube degradation typically initiates at tube support plates, they are included in the review of inspection data. The absence of a tube support plate signal in the expected location would be evident during review of eddy current data. No missing tube supports have been reported in the Turkey Point Plant steam generators. Further, abnormal or distorted support plate signals are expected to be reported for further evaluation by lead analysis personnel. Further evaluations have included historical data reviews and rotary probe inspections. No degradation of the tube support plates has been confirmed by these evaluations.

**NRC Requested Information Item 1 (b)**

*Whether visual or video camera inspections on the secondary side of the steam generators have been performed at the facility to gain information on the condition of steam generator internals (e.g., support plates, tube bundle wrappers, or other components). If the addressee has performed such inspections, include a discussion of the findings.*

**FPL Response**

Tubesheet regions in all Turkey Point Plant steam generators have been subjected to secondary side visual and video camera inspections following sludge lancing at each refueling outage. These inspections are completed through openings in the shell and bundle wrapper. Any movement in the bundle wrapper openings relative to the shell openings would be evident. No such movement has been noted. During these inspections, small objects (i.e.; wire segments and small screws), which are not indicative of internals degradation, have occasionally been detected and removed. Tubes in the area of the objects are inspected by eddy current, and removed from service if defective. When such objects cannot be removed after reasonable efforts, they are evaluated for potential effects on tube integrity during subsequent operation. If it can be reasonably determined that tube damage which exceeds the allowable limits of the technical specifications will not occur, the object may be left in place, and the adjacent tubes checked at subsequent inspections to assess their condition.

Tube plugging information for the Turkey Point Plant shows that no tubes have been plugged due to secondary side foreign object damage in Unit 4. In Unit 3, a secondary side foreign object resulted in plugging two tubes in May 1985, and four tubes in March 1997. These tubes were located in the periphery of the 3B SG. Disposition of the indications, and evaluation of the foreign object, was conducted in accordance with the discussion in the preceding paragraph. The object was determined to be debris or slag from the SG replacement effort and, therefore, is not a result of degradation of secondary side internal components.

Interior regions of the tube bundle and support plates have been visually inspected in one or more steam generators at each refueling outage since 1994. These inspections are conducted to assess the extent of tube bundle fouling and the effectiveness of high volume bundle flushing techniques. These inspections show that tube support plate surfaces and flow holes are relatively clean of feed train corrosion product buildup. No degradation of the tube support plates was noted. Support plates at Turkey Point Units 3 and 4 are quatrefoil stainless steel design and have a low susceptibility to degradation.

Secondary side crawl through inspections of the steam separation and feedring equipment have typically been conducted in one or more SGs each outage since 1991 at the Turkey Point Plant. No degradation or erosion/corrosion of internal components has been noted in these inspections. In 1994 at Unit 4, and in 1992 at Unit 3, loose objects were removed from the upper deck plates in the upper steam separation area. It was determined the objects were scrap material from the SG replacement efforts. A review of Westinghouse replacement procedures shows that the steam separation packages were lowered into place while the steam drums were inverted. This allowed such objects to become lodged above the upper deck plates when the steam drums were turned upright.

Ultrasonic (UT) thickness measurements were recorded for the carbon steel feedring and j-nozzles in the Turkey Point Unit 4 B SG in 1986. The measurements showed moderate thinning of the j-nozzles, but no thinning of the feedring. The carbon steel j-nozzles were replaced with Alloy 600 j-nozzles in both units in 1989 and 1990. Visual inspections and UT thickness measurements were conducted during the replacement to assess the condition of the feedring. A review of the Unit 3 inspection records for this work shows that no erosion/corrosion of the feedring or j-nozzle boreholes was detected during the replacement.

#### NRC Requested Information Item 1 (c)

*Whether degradation of steam generator internals has been detected at the facility, and how the degradation was assessed and dispositioned.*

#### FPL Response

No degradation of steam generator internals has been detected at the Turkey Point Plant, with the exception of moderate thinning in carbon steel j-nozzles in 1986. In 1989 and 1990, all carbon steel j-nozzles

were replaced with Alloy 600 j-nozzles, which have a low susceptibility to erosion/corrosion.

#### **NRC Requested Information Item 2**

*If the addressee currently has no program in place to detect degradation of steam generator internals, include a discussion and justification of the plans and schedule for establishing such a program, or why no program is needed.*

#### **FPL Response**

Item 2 is not applicable to the Turkey Point Plant. As discussed above, Turkey Point has conducted routine inspections of steam generator internals since 1984 and plans to follow the industry program.

#### **Inservice Inspection Plans**

As previously discussed, the Turkey Point Plant program has included routine FOSAR inspections after sludge lancing at each refueling outage since 1984. Inspections of the steam separation and feedring equipment have typically been conducted since 1991. Recent inspections have included peripheral and internal areas of support plates and upper tube bundle regions. The latest industry guidance for inspection of secondary side internals, discussed below, will be considered for inclusion in the Turkey Point Plant program and will be updated as appropriate based on site specific experience and evaluation of industry results of these inspections.

#### **Tube Support Plate Ligament Erosion/Corrosion and Cracking**

No change in the current Turkey Point Plant program is considered necessary for inspections of tube supports to assess their condition for ligament erosion/corrosion and cracking. This is considered a low susceptibility event because tube support plates in Model 44F steam generators in the Turkey Point Plant are stainless steel and have low susceptibility to erosion/corrosion. The chromium content of stainless steel, support plates is expected to preclude the occurrence of this degradation mechanism. Eddy current inspection for ligament cracking is not applicable for support plates with a quatrefoil broached hole design. However, distorted tube support signals will continue to be reported for further evaluation during routine eddy current inspections.

Sample inspections of the support plates, including patch plate and plug weld regions, were conducted in recent outages with no degradation noted. Sample inspections in the tube lane region of the top support plate (where flow holes are provided instead of elongated slots) has also been conducted in recent outages, and no degradation or misaligned drill holes were noted.



Wrapper Drop/Cracking

No change in the current Turkey Point Plant program is considered necessary to assess the condition of the tube bundle wrapper. Wrapper drop or cracking has not been reported in any Westinghouse design SG, and are considered to be low susceptibility events. Proper alignment of the wrapper is required to facilitate installation of sludge lancing equipment. Routine eddy current inspections are expected to detect tube deformation in the periphery of the first tube support plate resulting from potential wrapper misalignment. Inspection of the wrapper supports will be conducted if misalignment is detected during sludge lancing or if deformation of periphery tubes is detected.

Transition Cone Girth Weld

No change in the current Turkey Point Plant program is considered necessary. Inspect in accordance with ASME Section XI Inservice Inspection Program requirements for the steam generator shell.

Feed Water Nozzle

No change in the current Turkey Point Plant program is considered necessary. Inspect in accordance with ASME Section XI Inservice Inspection Program requirements. Loose parts monitoring is expected to help detect potential degradation of the feed water nozzle.

Upper Package

No change in the current Turkey Point Plant program is considered necessary for inspection of steam separation and feeding equipment. Such inspections have typically been conducted in 1 or more steam generators at each outage since 1991 with no evidence of degradation reported other than moderate thinning of carbon steel j-nozzles which were replaced with Alloy 600 nozzles.

As previously stated, a more detailed evaluation of Model 44F design steam generators is scheduled for completion by June of 1998. The Turkey Point Plant plans to implement changes in this inspection plan based on the results of inspections at Turkey Point and similar units, and industry recommendations as applicable.



