FPL.

FEB 19 2014

L-2014-034
10 CFR 50.36

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-00001

Re: Turkey Point Unit 4
Docket No. 50-251
Response to Request for Additional Information Regarding
Steam Generator Tube Inspection Report

Reference:

1. FPL letter, L-2013-246, "Turkey Point Unit 4, Docket No. 50-251, Steam Generator Tube Inspection Report," September 19, 2013. (TAC MF2886)
2. NRC to FPL, "Request for Additional Information – Turkey Point 4 – 2013 Steam Generator Inspections," January 15, 2014. (TAC MF2886)

By letter dated September 19, 2013, Florida Power & Light Company (FPL) submitted the Turkey Point Unit 4 Cycle 27 Refueling Outage Steam Generator Tube Inspection Report (Reference 1). (ML13277A358)

On January 15, 2014, the NRC requested additional information regarding Reference 1. The enclosure to this letter provides FPL's response to the request for additional information (Reference 2). (ML14015A544)

Should there be any questions, please contact Robert Tomonto at (305) 246-7327.

Sincerely,

Michael Kiley
Vice President
Turkey Point Nuclear Plant

Attachment

cc: Regional Administrator, Region II, USNRC.
Senior Resident Inspector, USNRC, Turkey Point Plant

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LIRR

ATTACHMENT TO
L-2014-034

Response to Request for Additional Information Regarding
Unit 4 Steam Generator Tube Inspection Report

NRC RAI #1:

It was indicated that the SGs had accumulated 23.05 effective full power years of operation at the completion of cycle 26 (fall 2012 outage). Please provide the number of effective full power years the SGs had accumulated at the time of the first refueling outage following replacement (1984). In addition, please provide the number of effective full power years the SGs had accumulated for the last several refueling outages.

FPL Response for RAI #1:

At the first refueling outage following steam generator (SG) replacement (End of Cycle 9, 1984), the SGs had accumulated 0.65 Effective Full Power Years (EFPY).

Cycle 22 was 1.24 EFPY, resulting in 17.70 cumulative EFPY for the replacement SGs.
Cycle 23 was 1.26 EFPY, resulting in 18.96 cumulative EFPY for the replacement SGs.
Cycle 24 was 1.41 EFPY, resulting in 20.37 cumulative EFPY for the replacement SGs.
Cycle 25 was 1.24 EFPY, resulting in 21.61 cumulative EFPY for the replacement SGs.
Cycle 26 was 1.44 EFPY, resulting in 23.05 cumulative EFPY for the replacement SGs.

NRC RAI #2:

In Table 1:

a. It was indicated that the bobbin probe examination included tubes with low-voltage U-bend offsets. Please clarify how many tubes per SG have been characterized as having these offsets. Does this category of tubes only include tubes in "high-row" tubes (i.e., tubes that were not stress-relieved following bending)? Are there any "low-row" tubes that have an eddy current offset? If so, please distinguish between the low-voltage offset tubes (which the staff infers are tubes that are commonly referred to as "-2-sigma tubes") and tubes that have been stress relieved that have an eddy current offset.

b. For the rotating probe inspection of the dings in the U-bend and of hot-leg dents/dings at structures, please clarify whether this included all dents/dings regardless of their amplitude as determined from the bobbin coil probe or whether only dents/dings that exceeded certain amplitudes were inspected.

c. For the rotating probe inspections of the U-bend dings and the hot-leg dents/dings at structures, it was indicated that these inspections included tubes/locations not inspected in the prior inspection. The NRC staff was under the impression that the prior inspections included inspecting 100% of these locations. As a result, please clarify the "not inspected in prior inspection" phrase.

FPL Response for RAI #2:

(a) There are currently 58 tubes in service in Unit 4 that have been identified with low voltage U-bend offsets (14 in SG A, 18 in SG B, and 26 in SG C).

Fifty-seven (57) of the tubes are in the high-row tube category (Rows 9 or higher / not stress relieved after bending). All of these 57 tubes meet the "-2-sigma tube" criteria using a statistical evaluation.

One (1) tube is in the low-row tube category (Rows 1-8 / stress relieved after bending). The one affected low-row tube was in SG C, Row 5, Column 41.

All 58 tubes with low voltage U-bend offsets were subjected to a review specifically looking for flaw precursors. All 58 tubes remain in service.

(b) For the rotating probe inspection of the dents/dings in the U-bend, fifty-percent (50%) were inspected regardless of their amplitude as determined from the bobbin coil probe. Similarly, for the rotating probe inspection of the dents/dings in hot-leg structures, fifty-percent (50%) were inspected regardless of their amplitude as determined from the bobbin coil probe.

(c) During the End of Cycle 24 (EOC-24) inspection in 2009, 100% of the hot-leg dents/dings at structures and 100% of u-bend dings were inspected.

The decision to inspect 100% of the dents/dings during EOC-24 was proactive to provide flexibility in planning future inspections. Only a 50% inspection of dents/dings was required.

During EOC-26 in 2012, 50% of the dents/dings in the u-bend and at hot-leg supports were inspected.

The statement "not inspected in prior inspection" is a boilerplate statement used in the inspection plan because normally only 50% of the dents/dings are sampled at each inspection.

Since 100% of the u-bend and hot leg dents/dings were inspected at EOC-24 in 2009, the statement "not inspected in prior inspection" (in the EOC-26 inspection plan) does not apply.

NRC RAI #3:

The tube in row 17, column 74 in SG B was stabilized and plugged because of wear associated with a possible foreign object. Please discuss whether the presence of the part was confirmed through visual examinations. If not, please discuss how it was determined that the wear was a result of a loose part (e.g., based on eddy current inspection data indicating the presence of a possible loose part). Although no qualified sizing technique exists for this degradation mechanism, please confirm that this tube had adequate integrity. Was the depth of this indication estimated to be 5 percent through-wall (as indicated in Attachment 3 in the "Util 1" field)?

FPL Response for RAI #3:

The wear indication at the 01H tube support structure in row 17 column 74, SG B was detected with the bobbin probe and confirmed with the +Point™ rotating probe. The

wear indication was attributed to a foreign object because a possible loose part (PLP) signal was reported with the +Point™ rotating probe at that location coincident with wear at the upper edge of 01H. It was not possible to visually confirm the presence of a foreign object because that area was inaccessible for inspection by the Foreign Object Search and Retrieval (FOSAR) operations.

The +Point™ technique used for detection and sizing was qualified for wear at broached tube support plates.

The +Point™ technique was evaluated for detection of PLP wear with part present and determined to be acceptable for extended application for this mechanism. This technique was extended for sizing for condition monitoring (CM) purposes, but not for service, based on an engineering evaluation of the eddy current signal behavior. This justification was documented in accordance with industry guidelines. The depth of this indication was estimated with the +Point™ rotating coil to be 5 percent through-wall.

The nondestructive examination (NDE) depth fell below the CM limit for meeting the structural integrity performance criteria margin requirement of three times the normal operating pressure differential (3xNOPD). This calculated result was confirmed by comparing the +Point™ voltage for the indication against the voltage screening parameters provided in industry guidelines. The indication voltage was below the threshold voltage for both proof test and leakage screening of volumetric flaws. Therefore, in situ pressure testing was not required based on minimum 95-50 burst pressure calculation and by the voltage screening threshold criteria.

NRC RAI #4:

In item 4 of Table 5, there is reference to a small hard pile. Please clarify the nature of this small hard pile (since it seems to be distinguished from deposits, scale, sludge pile, and sludge rocks as used in other descriptions in this table).

FPL Response for RAI #4:

Item 4 of Table 5 refers to a "small hard pile" initially reported by the secondary side visual inspections during the EOC-24 refueling outage in 2009, after sludge lancing operations were completed.

A subsequent review of a secondary side photo of the location (from 2009) shows a small pile of hard sludge, approximately one-quarter inch (.25") in depth, not removed during the sludge lancing process in 2009.

During the EOC-26 refueling outage in 2012, the small sludge pile was not visually observed during the post sludge lancing visual inspections, indicating that the sludge was no longer present.

For clarification, "deposits" and "scale" normally refer to material deposition on the tube outside surface, while "sludge rocks" and "sludge piles" normally refer to sludge material resting on the top of the tubesheet secondary face. A "hard pile" would be considered a

pile of sludge that was adhered together rather than powdery and loose in nature, but having the same general topography.

NRC RAI #5:

To facilitate an understanding of some of the responses to the above questions, please clarify the following with respect to the design of the SGs:

a. Tube outside diameter (0.875-inches)
b. Tube wall thickness (0.050-inches)
c. Number of tubes per SG (3,214)
d. Tube pitch
e. Tubesheet thickness
f. Tube support material (405 stainless steel)
g. Shape of holes (broached quatrefoil for tube support plates and round holes for flow distribution baffle)
h. The tubes that were stress relieved following bending (rows 1-8).

FPL Response for RAI #5:

The correct design information is as follows:

a. Tube outside diameter (0.875-inches)
b. Tube wall thickness (0.050-inches)
c. Number of tubes per SG (3,214)
d. Tube pitch (1.234-inches square pitch pattern)
e. Tubesheet thickness (22.08-inches nominal thickness)
f. Tube support material (Type 405 stainless steel)
g. Shape of holes (broached quatrefoil for tube support plates and round holes for flow distribution baffle)
h. The tubes that were stress relieved following bending (rows 1-8).

NRC RAI #6:

In section "i" of the licensee's report, conclusions regarding meeting the licensee's accident induced leakage performance criteria for the prior operating cycle are presented (i.e., condition monitoring assessment). In the last sentence, however, there is a conclusion that neither the normal operating leakage limit nor the accident induced leakage limit will be challenged during the next operating period. Although the conclusion regarding the future operating period may be correct, it is not clear how this conclusion is drawn from the prior two paragraphs (it appears that past trends in operating primary-to-secondary leakage are being used to infer future trends). Please clarify.

FPL Response for RAI #6:

This statement is meant to convey that the calculated leak rates for both the previous and the next inspection interval are negligible. The conclusion that the normal operating and the accident-induced leakage limits will not be challenged for the next operating period is based on the fact that there are no existing degradation mechanisms that have the potential for leakage.

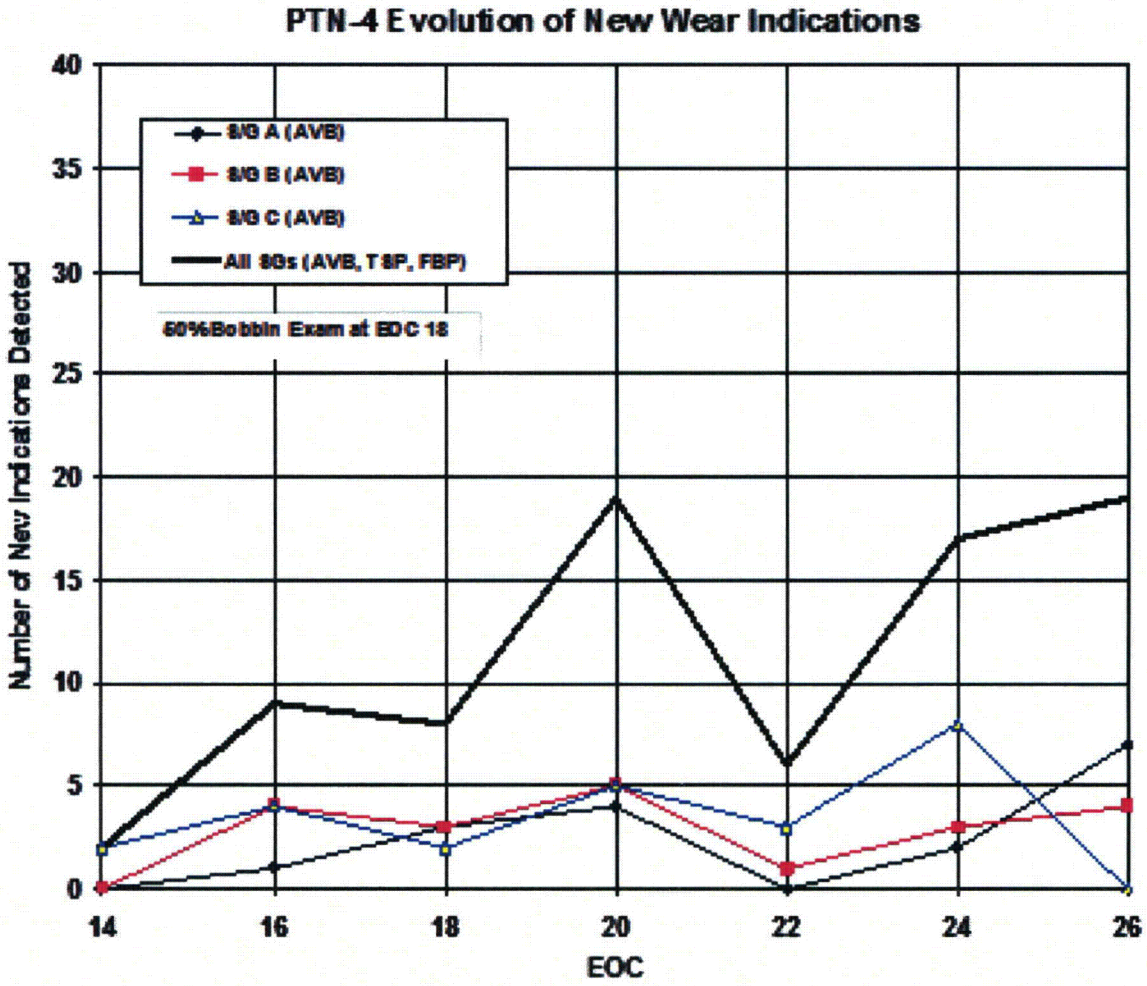
Since the calculated accident-induced leak rate for the existing degradation mechanisms is negligible, then the accident-induced leakage limit Technical Specification requirement of 0.2 gpm (288 gpd) will be satisfied for the current normal operating leakage limit of 150 gpd (1.82 X 150 gpd < 288 gpd). Therefore, neither leakage limit will be challenged.

NRC RAI #7:

It appears that the number of new wear indications is increasing. Please discuss any insights on this trend.

FPL Response for RAI #7:

The figure below shows the trend in new wear indications at Turkey Point Unit 4. The trend for all wear mechanisms has not been significantly increasing. For AVB wear only, the number of new wear indications is a weak function of operating time. The variability in the uniform trend is most likely due to the sensitivity of the NDE results to the probability of detection, which reflects both technique and analyst uncertainties.



NRC RAI #8:

Besides the cracking observed in 2012, and the pitting observed in 2000, please clarify whether any other corrosion related degradation has been detected.

FPL Response for RAI #8:

No other corrosion related degradation has been detected in Turkey Point Unit 3 or Unit 4.

NRC RAI #9:

Eleven indications of possible primary water stress corrosion cracking indications were identified near the tube end during the 2012 inspections. Although these indications were in a region in the tube not required to be inspected, please discuss whether the licensee assessed the orientation of these indications (axial, circumferential) and whether they were new (not present in prior inspections) or were present in prior

inspections and not reported (since they were below the region required to be inspected). Were the 11 indications in 11 tubes, or were there multiple indications in a tube or tubes? What is the hot-leg operating temperature at Turkey Point 4?

FPL Response for RAI #9:

The orientation of the eleven indications was assessed and they were all determined to be axial. This lower portion of the tubesheet had not been previously inspected.

The eleven indications are in eleven different tubes; (one indication per tube).

The hot leg operating temperature (T-Hot) of Turkey Point Unit 4 is currently ~610 °F.

Abbreviations and Acronyms used in this document:

AVB	Anti-Vibration Bar
CM	Condition Monitoring
EFPY	Effective Full Power Years
EOC	End of Cycle
FOSAR	Foreign Object Search and Retrieval
gpd	gallons per day
gpm	gallons per minute
NDE	Nondestructive Examination
PLP	Possible Loose Part
SG	Steam Generator
01H	First broached support plate on the hot-leg side of the SG