Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

October 1, 2010

L-2010-223
10 CFR 50.55a
10 CFR 50.36

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

Re: St. Lucie Unit 2
Docket No. 50-389
RAI Reply for Refueling Outage SL2-18
Steam Generator Tube Inspection Report

On November 9, 2009, via FPL Letter L-2009-254, St. Lucie submitted the Unit 2 Technical Specification 6.9.1.12 steam generator tube inspection report for the spring 2009 refueling outage (SL2-18). Via docketed email (ML102360491 and ML102370210), the NRC requested additional information on the submitted report. The attachment to this letter provides the FPL reply to the request for additional information.

Please contact Ken Frehafer at (772) 467-7748 should you have any questions regarding this submittal.

Sincerely,

Eric S. Katzman
Licensing Manager
St. Lucie Plant

ESK/KWF

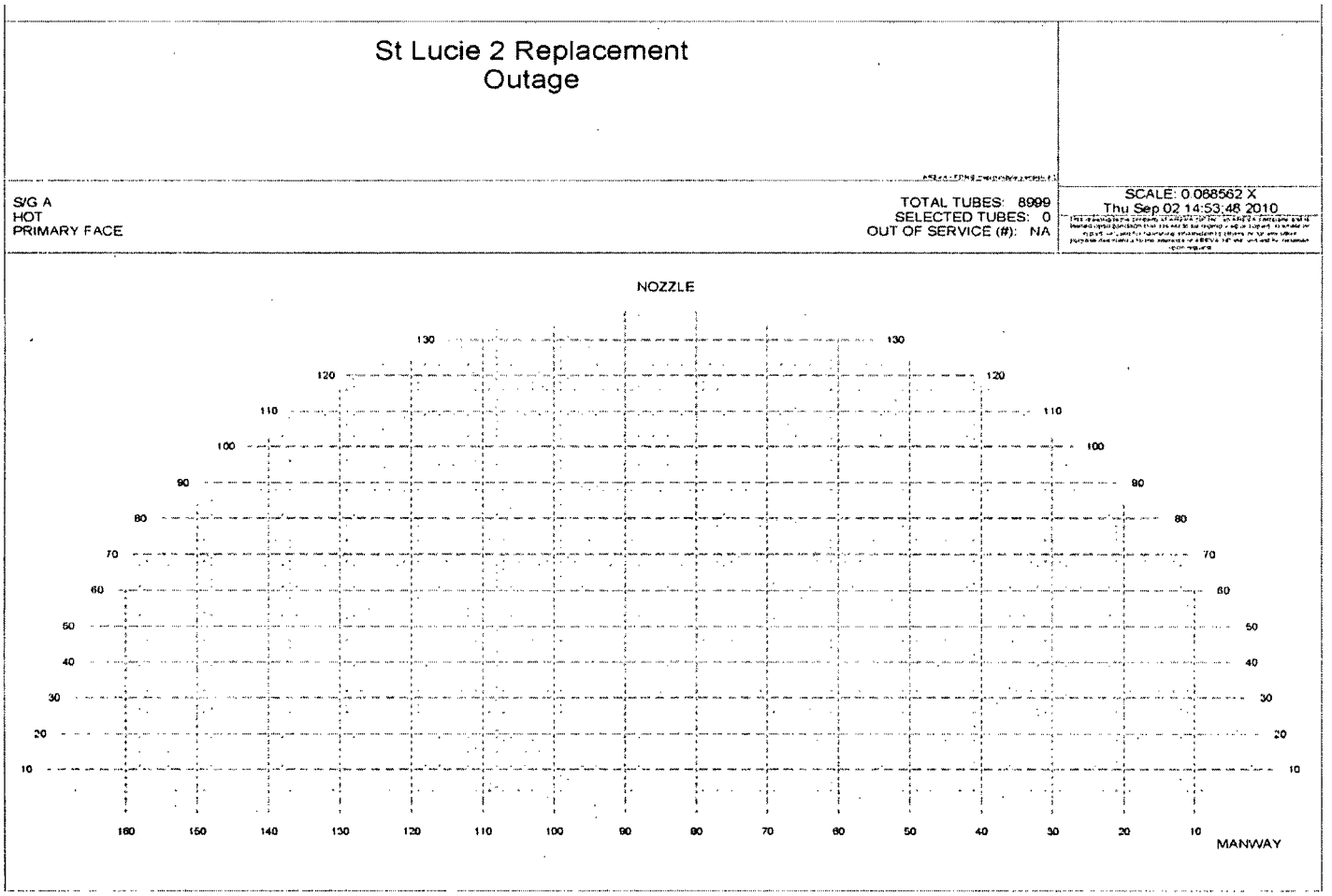
Attachment

A001
NRR

1. General information concerning the design of your replacement SGs was provided in the submittal. In order for the staff to better understand the design of your replacement SGs, please provide the following information:

   a. A tubesheet map depicting the row and column numbers,

   Response: The tubesheet map below is generated from Areva software using SG configuration information. Rows run parallel to the divider plate and columns run perpendicular to the divider plate.



   b. Tube material and manufacturer

   Response: Tube Material: Alloy 690TT
   Manufacturer: Sumitomo Metal Industries, Ltd.

c. Outside diameter and wall thickness of the tubes,

Response: Tube nominal dimensions are 0.750 inch OD and 0.043 inch wall thickness.

d. Number of tubes in each SG,

Response: 8999 tubes per steam generator

e. Tube pitch (e.g., triangular, 1.00-inch center-to-center),

Response: 1.0" Triangular pitch, center-to-center.

f. Expansion method and extent (e.g., hydraulic expansion for the full length of the tubesheet),

Response: All tubes are hydraulically expanded for the full depth of the tubesheet.

g. Tube support plate material and design,

Response: Seven (7) Trefoil Broached Plates (1.181" thick) made from 410 Stainless Steel. Four (4) sets of Anti-Vibration Bars (0.112" thick) made from 405 Stainless Steel.

h. Flow distribution baffle design, if applicable,

Response: Not Applicable

i. Whether tubes were stress relieved after bending, and if so, the rows that were stress relieved,

Response: Rows 1-15 were stress relieved after bending.

j. The smallest U-bend radius

Response: 4.134" (Row 1).

k. Heat transfer surface area.

Response: 93,637 sq. ft. (based on O.D.).

2. One tube was inspected with a rotating probe due to a tubesheet drill hole anomaly and another tube was inspected for a "tube shaving signal." Briefly discuss the nature of the anomaly and the "shaving signal."

Response: Regarding the drill hole anomaly: The hot leg tubesheet bore of tube Row 76

Col 103 in SG "B" has a zone of slightly enlarged hole diameter. The zone starts approximately 4" above the primary face of the tubesheet, is 7.5" long and is locally oversized from 0.002 to 0.005 inches. This location was examined during SL2-18 with the rotating coil and no degradation was detected.

Regarding the "tube shaving signal": A secondary side tube shaving signal was reported in S/G B Row 88 Column 93 above the cold leg tubesheet, during the pre-service rotating coil examination in 2007. The attributes of the shaving signal were consistent with a similar signal observed in another Areva domestic replacement steam generator, where visual examination confirmed the presence of a narrow shaving of tubing that had been "shaved" off the tube wall during tube insertion. This location was re-examined during the SL2-18 examination with the rotating coil. No degradation was detected and the shaving signal was no longer present.

3. Confirm that no tubes were plugged prior to placing the steam generators in service (i.e., pre-operational plugging at the factory and/or on site).

   Response: No tubes were plugged prior to placing the steam generators in service.

4. It appears that not all wear scars were inspected with a rotating probe. Given that the nature of wear indications may differ from support to support (single sided versus double sided; tapered versus uniform), how was it ensured that an appropriate sizing technique was used? In addition, please discuss how it was confirmed that the indications were associated with the support (i.e., facing the support and not the result of some other degradation mechanisms such as wear from a loose part). For tubes sized with a rotating probe and a bobbin coil probe, what is the official size estimate (e.g., the most conservative)?

   Response: Wear scars were reported at anti-vibration bars and at tube supports at St. Lucie Unit 2 in the May 2009 steam generator inspection. The number of indications at these locations is summarized in the table below.

St. Lucie Unit 2– May 2009
Summary of Wear Indications At
Anti-Vibration Bars and Tube Support Plates

Location	Mechanism	S/G 2A	S/G 2B	Total
Anti-Vibration Bars	Wear	3700	2157	5857
Tube Supports	Wear	7	3	10
Loose Parts	Wear/Volumetric	0	0	0
S/G Total:		3707	2160	5867

The bobbin coil is qualified for detection and sizing of wear scars at broached tube supports and anti-vibration bars via EPRI technique 96004.1, Rev. 11. The analysis of wear scars at anti-vibration bars included an assessment by lead data analysts to determine the appropriate depth curve to be applied (i.e., based on tapered or uniform wear scars). The majority of wear scars at anti-vibration bars were uniform and were, therefore, depth sized with a uniform wear scar depth curve. Seven of the wear scars at anti-vibration bars appeared to be tapered. These seven locations were depth sized using both tapered and uniform wear scars. The final depth for these wear scars were based on a tapered wear scar depth curve, which yielded a more conservative depth.

Both the bobbin and +Point™ analysis techniques are capable of determining the axial position of wear scar indications within the support structure. Bobbin coil data, however, does not provide the capability to determine if there is a single wear scar present, or multiple wear scars at different locations azimuthally at the same axial location. If more than one wear scar is present, however, bobbin depth sizing would be conservative as multiple indications produce an additive effect. That is, if two wear scars were present at the same axial location but separated azimuthally (e.g., by 180 degrees), the cumulative effect would result in a maximum depth estimate that is greater than the larger of the two wear scars. However, even with the potential cumulative effect of multiple wear scars none of the estimated depths met the tube plugging criterion of 40% through-wall.

The +Point™ probe was also site-validated for detection and sizing of wear scars at anti-vibration bars via extension of EPRI technique 96910.1, Rev. 10. Supplemental +Point™ probe inspections confirmed that some of the bobbin wear scars at the anti-vibration bars were actually two wears on opposite sides of the tube at the same axial location. Therefore, supplemental +Point™ probe inspections were conducted on approximately 75 wear scars at anti-vibration bars measuring 20% or greater through-wall depth by the bobbin coil. If two wear scars were determined to be present, independent depth estimates from the +Point™ probe inspections were used to improve sizing accuracy for condition monitoring and operational assessment input. Tube plugging decisions relative to the Technical Specification plugging limit of 40% through-wall for all wear scars at anti-vibration bars were based on the bobbin coil depth estimates, including those locations where more than one wear scar was determined to be present.

Both the bobbin probe, via EPRI technique 96004.1, Rev. 11, and the +Point™ probe, via EPRI technique 96910.1, Rev. 10, are qualified for detection and sizing of wear scars at broached tube supports without extension. As discussed above, however, the bobbin probe is not capable of distinguishing the presence of multiple wear scars at the same axial location, and can lead to overly conservative depth estimates. Therefore, all ten of the wear scars at broach supports were officially sized using the +Point™ probe. The largest wear scar at broached tube supports was 11% through-wall, and all of the +Point™ voltages were less than a half volt.

The data analysis process at St. Lucie includes an assessment for the presence of possible loose parts. If a metallic loose part is present in combination with the support structure and a wear scar, it is expected that the low frequency channel would detect such a part. In addition, supplemental +Point™ probe inspections would be capable of determining if the wear scar was associated with a potential loose part (e.g., if a wear scar is not facing the contact point with the anti-vibration bar). None of the wear scars were determined to be associated with possible loose parts.

5. It appears that approximately 2000 tubes have wear indications at the anti-vibration bars. Discuss the extent to which this is consistent with the operating experience of similarly designed steam generators.

   Response: Domestic Recirculating replacement steam generators manufactured by Areva include St. Lucie Unit 2 and three other units. AVB wear indications at two of these units is similar to that reported in the St. Lucie Unit 2 Replacement steam generators, but the number of wear scars reported at the first inspection at both of these units was less than 100. More recently, AVB wear indications reported at the remaining unit are also similar to those reported at St. Lucie Unit 2, but the number reported at this unit was approximately 1560. The vast majority of indications in the inspections of Areva replacement steam generators to date are less than 20% through-wall. It is our understanding that the French data analysis practice does not require reporting wear indications below 25% through-wall depth and, therefore, it is not possible to provide this comparison for foreign steam generators designed by Areva.