

**FPL REPLY TO:**  
**STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS**  
**PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION**  
**FLORIDA POWER AND LIGHT COMPANY**  
**SAINT LUCIE NUCLEAR PLANT UNIT 2**  
**DOCKET NO. 50-389**

The following discussion points have been prepared to facilitate the phone conference arranged with Florida Power & Light Company to discuss the results of the steam generator (SG) tube inspections to be conducted during the upcoming St. Lucie Nuclear Plant, Unit 2 refueling outage (SL2-16). This phone call is scheduled to occur toward the end of the planned SG tube inspection interval, but before the unit completes the inspections and repairs.

The staff plans to document a brief summary of the conference call as well as any material that is provided in support of the call.

**Status of inspections as of 0800 on 5/5/06 for SL2-16.**

		Exams Programmed	Exams Acquired	Exams Evaluated	% Complete
A	Bobbin Exams	7163	7159	7159	99.94%
A	RPC H/L Expansion Transitions	6922	6922	6921	99.99%
A	RPC C/L Expansion Transitions	236	236	80	33.90%
A	RPC Row 1 & 2 U-Bends	23	0	0	0.00%
A	RPC H/L,C/L and U-Bend Dings	408	296	176	43.14%
A	RPC Wear U-Bend Region & TSP's	360	280	189	52.50%
A	RPC Non-Expanded Tubes	21	21	20	95.24%
B	Bobbin Exams	6891	6870	6870	99.70%
B	RPC H/L Expansion Transitions	6702	6700	6700	99.97%
B	RPC C/L Expansion Transitions	227	0	0	0.00%
B	RPC Row 1 & 2 U-Bends	25	0	0	0.00%
B	RPC H/L,C/L and U-Bend Dings	414	98	76	18.36%
B	RPC Wear U-Bend Region & TSP's	260	19	7	2.69%
B	RPC Non-Expanded Tubes	1	0	0	0.00%
<b><u>+Point Diagnostic Exams for Bobbin Indications (Potential Pluggables)</u></b>					
		Exams Programmed	Exams Acquired	Exams Evaluated	% Complete
A	RPC Bobbin I-Code/OXP/MBM	779	715	465	59.69%
A	RPC Loose Part and Bounding	28	28	7	25.00%
A	RPC Newly Reported DNG / New DNT	6	6	2	33.33%
B	RPC Bobbin I-Code/OXP/MBM	1160	760	682	58.79%
B	RPC Loose Part and Bounding	0	0	0	0.00%
B	RPC Newly Reported DNG / New DNT	6	0	0	0.00%

1. Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.

Reply – Primary-to-secondary leakage for Cycle 15 has been less than detectable.

2. Discuss whether any secondary side pressure tests were performed during the outage and the associated results.

Reply – No secondary side pressure tests were performed on the steam generators.

FPL REPLY TO:  
STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS  
PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
FLORIDA POWER AND LIGHT COMPANY  
SAINT LUCIE NUCLEAR PLANT UNIT 2  
DOCKET NO. 50-389

3. Discuss any exceptions taken to the industry guidelines.

Reply – The only exception taken is that bobbin coil voltage is normalized at 5 volts using the 20% flat bottom holes on the ASME calibration standard, where as current industry practice normalizes at 4 volts. This exception is necessary to maintain consistency for comparison of inspection results with St. Lucie 2 historical data, some of which predates establishment of the current industry practice. Further, it is acceptable because the practice provides conservative voltage values.

4. For each steam generator, provide a description of the inspections performed including the areas examined and the probes used (e.g., dents/dings, sleeves, expansion transition, U-bends with a rotating probe), the scope of the inspection (e.g., 100 percent of dents/dings greater than 5 volts and a 20 percent sample between 2 and 5 volts), and the expansion criteria.

■ Visual Examination of All Tube Plugs

■ Bobbin Probe All Active Tubes

- Screen Dings <5 Volts in Straight Sections
- Full Length Row 3-140, Straight Length Row 1-2

■ Plus Point Probe

- 100% Hot Leg Top of Tubesheet (+3" / -13")
- Cold Leg Periphery Tubes (+3"/-2")
- 20% Row 1-2 U-bends (A-23, B-25)
- 20% Wear at Vertical Straps (A-86, B-58)
- 100% Wear at Eggcrates, HL & CL Diagonals (A-274, B-202)
- Full Tubesheet if No Tube Expansion (A-21, B-1)

■ Plus Point Probe for Dings

	<u>SGA</u>	<u>SGB</u>
▸ All Dings Hot Leg Tubesheet to 1st Support	68	78
▸ All Dings >5 volts 1st Support to HL Bend	57	80
▸ All Dings in HL & CL Square Bends Row 19-140	90	68
▸ All Dings >5 volts in Horizontal Run Row 19-140	71	102
▸ All Dings in Rows 1-18 U-Bends	113	89
▸ 20% Dings >5 volts CL Tubesheet to CL Bend	<u>17</u>	<u>23</u>
	416	440

5. For each area examined (e.g., tube supports, dents/dings, sleeves, etc.), provide a summary of the number of indications identified to-date of each degradation mode (e.g., number of circumferential primary water stress corrosion cracking indications at the expansion transition). For the most significant indications in each area, provide an estimate of the severity of the indication (e.g., provide the voltage, depth, and length of the indication). In particular, address whether tube integrity (structural and accident induced leakage integrity) was maintained during the previous operating cycle. In addition, discuss whether any location exhibited a degradation mode that had not previously been observed at this location at this unit (e.g., observed circumferential primary water stress corrosion cracking at the expansion transition for the first time at this unit).

**FPL REPLY TO:**  
**STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS**  
**PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION**  
**FLORIDA POWER AND LIGHT COMPANY**  
**SAINT LUCIE NUCLEAR PLANT UNIT 2**  
**DOCKET NO. 50-389**

<b>Summary of Indication by Degradation Mode</b>			
<b>Degradation Mode</b>	<b>Indication Count</b>		
	<b>SG A</b>	<b>SG B</b>	<b>Total</b>
<b>Axial ODSCC at Eggcrates</b>	<b>386</b>	<b>658</b>	<b>1044</b>
<b>Pitting Indications in Freespans</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Axial ODSCC at Tube Dings</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Axial ODSCC in Freespans</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Axial ODSCC at Top of Tubesheet</b>	<b>5</b>	<b>2</b>	<b>7</b>
<b>Axial IDSCC Below Top of Tubesheet</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>Circumferential ODSCC at Top of Tubesheet</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Wear at Diagonal, Vertical and Eggcrate Supports</b>	<b>713</b>	<b>493</b>	<b>1206</b>
<b>Wear at Top of Tubesheet</b>	<b>0</b>	<b>0</b>	<b>0</b>

<b>Summary of the Most Severe Indications</b>							
<b>Degradation Mode</b>	<b>SG</b>	<b>Location</b>	<b>Row / Col</b>	<b>Volts</b>	<b>Max. Depth</b>	<b>Len</b>	<b>ISPT Req'd.</b>
<b>Axial ODSCC at Eggcrates</b>	<b>A</b>	<b>04H+0.73</b>	<b>53 / 93</b>	<b>0.79</b>	<b>55%</b>	<b>1.9"</b>	<b>Yes</b>
	<b>B</b>	<b>02H+0.38</b>	<b>61/119</b>	<b>1.11</b>	<b>61%</b>	<b>1.33"</b>	<b>(2)</b>
<b>Pitting Indications in Freespans</b>							
<b>Axial ODSCC at Tube Dings</b>							
<b>Axial ODSCC in Freespans</b>							
<b>Axial ODSCC at Top of Tubesheet</b>	<b>A</b>	<b>TSH+0.15</b>	<b>73 / 71</b>	<b>0.17</b>	<b>27%</b>	<b>0.29"</b>	<b>No</b>
<b>Axial IDSCC Below Top of Tubesheet</b>	<b>A</b>	<b>TSH-0.69</b>	<b>29/107</b>	<b>0.53</b>	<b>39%</b>	<b>0.40"</b>	<b>No</b>
<b>Circumferential ODSCC at Top of Tubesheet</b>							
<b>Wear at Diagonal, Vertical and Eggcrate Supports</b>	<b>B<sup>(1)</sup></b>	<b>DHB+0.00</b>	<b>48 / 84</b>	<b>2.85</b>	<b>53%</b>	<b>NA</b>	
<b>Wear at Top of Tubesheet</b>							

1. This indication based on bobbin data. 2. Initial sizing results only (i.e., flaw profile pending).

No locations within either SG have exhibited any new degradation modes not previously observed.

FPL REPLY TO:  
STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS  
PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
FLORIDA POWER AND LIGHT COMPANY  
SAINT LUCIE NUCLEAR PLANT UNIT 2  
DOCKET NO. 50-389

In addition to the above discussions, all RCL indications that were detected on the pull out scans following diagnostic testing of a bobbin I-code indication are being retested with a qualified Plus Point technique for further characterization. Therefore, the 0.35 volt threshold criterion that was developed in the Jan-05 inspection for retesting RCL indications with a qualified technique is not being applied in this inspection. A total of 47 RCL indications have been detected as of the afternoon of 5/4/06. The retesting of these indications is still on going, but it appears that the results of the RCL indications will be consistent with those obtained in the prior inspection. That is, the RCL indications are consistent with the Operational Assessment model for the undetected flaw population.

6. Describe repair/plugging plans.

Reply – A combination of tube plugging and tube sleeving will be used to maintain total equivalent plugging to 2520 tubes/SG or less.

<u>PROJECTED NUMBER OF TUBE REPAIRS</u>			
<u>TOPIC</u>	<u>S/G A</u>	<u>S/G B</u>	<u>Comments</u>
Repairs Forecast	612	846	
Existing Plugged Tubes	1469	1709	From SL2-15
Total Repairs Forecast	2081	2555	All Damage Mechanisms
Sleeving Required	0	35	≤2520/SG & 600 Asymmetry

7. Describe in situ pressure test and tube pull plans and results (as applicable and if available).

Reply –In situ pressure tests planned currently include the indication listed in the reply to question 5. No tube pulls are planned for SL2-16.

8. Provide the schedule for SG-related activities during the remainder of the current outage.

Reply – Inspection activities are expected to be nearly complete on May 8<sup>th</sup>. Repair activities are expected to begin on May 9<sup>th</sup> and end on about May 19<sup>th</sup>. Secondary side sludge lance and inspections are scheduled between May 3<sup>rd</sup> and May 9<sup>th</sup>.

9. Discuss the following regarding loose parts:

- What inspections are performed to detect loose parts

Reply - A secondary side Foreign Object Search is performed for the annulus and blowdown lane in each SG. In addition, analysis of bobbin and rotating probe inspection data includes screening to detect potential loose parts. Secondary side and ECT inspection crews coordinate to ensure that possible loose part locations are investigated to determine if a part is present and if tube damage has occurred.

- A description of any loose parts detected and their location within the SG

**FPL REPLY TO:**  
**STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS**  
**PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION**  
**FLORIDA POWER AND LIGHT COMPANY**  
**SAINT LUCIE NUCLEAR PLANT UNIT 2**  
**DOCKET NO. 50-389**

Reply – Please see Table 1 for historical information. Two small magnetic parts were detected at the periphery in SG B cold leg on 5/4/06. One part is approximately 1/16" in diameter and less than 1/2" long. The 2<sup>nd</sup> part is approximately 0.15" thick by 1/2" wide by 1" long.

- If the loose parts were removed from the SG

Reply – Please see Table 1 for historical information. The smaller part in SG B mentioned above was removed. Retrieval efforts for the 2<sup>nd</sup> part were not successful. All adjacent tubes will be inspected with Plus Point and the part will be evaluated to determine if preventative plugging is necessary.

- Indications of tube damage associated with the loose parts

Reply – No tube damage has been detected due to loose parts in SL2-16. The cold leg periphery tubes are scheduled for rotating probe inspection.

- The source or nature of the loose parts if known for historical information.

Reply – Please see Table 1 for historical information. The origin of the small parts detected in SG B was not immediately known. They will be documented in the corrective evaluation system for evaluation.

**TABLE 1 – SUMMARY OF FOREIGN OBJECTS REMAINING IN THE ST. LUCIE  
UNIT 2 STEAM GENERATORS**

<b>S/G</b>	<b>DESCRIPTION</b>	<b>INITIAL LOCATION</b>	<b>SL2-15 LOCATION</b>	<b>Action Taken</b>
2A	Weld rod about ~3" above cold leg tubesheet	Cold leg tubesheet Row 106-110, Line 133-134 Initial detection EOC-3	Seen by FOSAR Retrieval Unsuccessful Not seen by ECT	Inspect all adjacent tubes. Adjacent tubes have been plugged if wear was detected.
2A	Solidified Sludge Rock	Cold leg tubesheet Row 13-14, Line 2	Not seen by FOSAR PLP at R15-17, L2-3 by ECT	Inspect all adjacent tubes. No wear detected.
2B	Solidified Sludge Rock	Hot leg tubesheet Row 106-107, Line 41-42	Inaccessible by FOSAR PLP at R105 L43 by ECT	Inspect all adjacent tubes. No wear detected.
2A	Cylindrical object 1/16" by 3/4" long	Cold Leg Row 7-8, Line 1-2	Seen by FOSAR Retrieval Unsuccessful Not seen by ECT	Inspect all adjacent tubes. No wear detected.
2A	Rectangular object .25" wide by 1" long	Cold Leg Row 15-17, Line 2-3	Seen by FOSAR Retrieval Unsuccessful PLP by ECT	Inspect all adjacent tubes. No wear detected.

The above foreign objects are evaluated and tracked by engineering evaluation.

FPL REPLY TO:  
STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS  
PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
FLORIDA POWER AND LIGHT COMPANY  
SAINT LUCIE NUCLEAR PLANT UNIT 2  
DOCKET NO. 50-389

10. Discuss the results of any secondary side inspections.

Reply – A secondary side Foreign Object Search is performed for the annulus and blowdown line in each SG (See reply to question 9). No secondary side inspections are planned for the upper portion of the SGs during SL2-16.

11. Discuss any unexpected or unusual results.

Reply – The only unexpected results is that the number of indications observed in the SGs is lower than expected. The voltage, depth and length distributions are consistent with observations from prior inspections and within expectations (Refer to Figures 1-5).

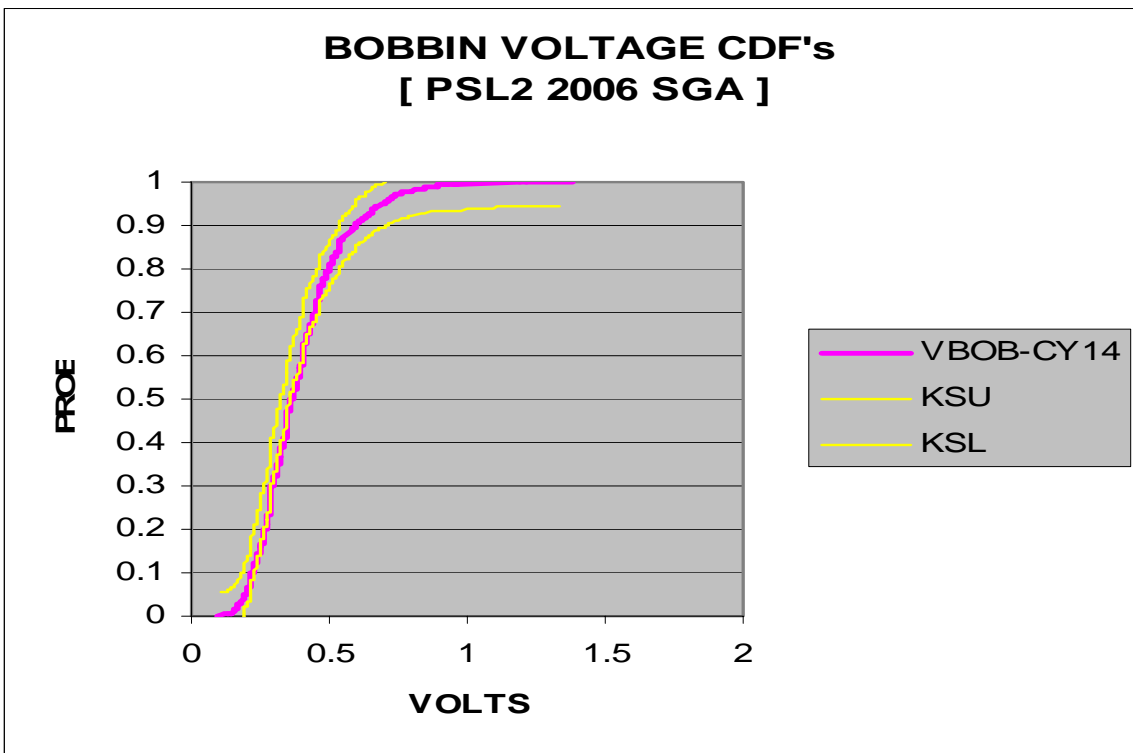


Figure 1 – CY 14 and CY-15 Bobbin Indication Voltages

FPL REPLY TO:  
STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS  
PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
FLORIDA POWER AND LIGHT COMPANY  
SAINT LUCIE NUCLEAR PLANT UNIT 2  
DOCKET NO. 50-389

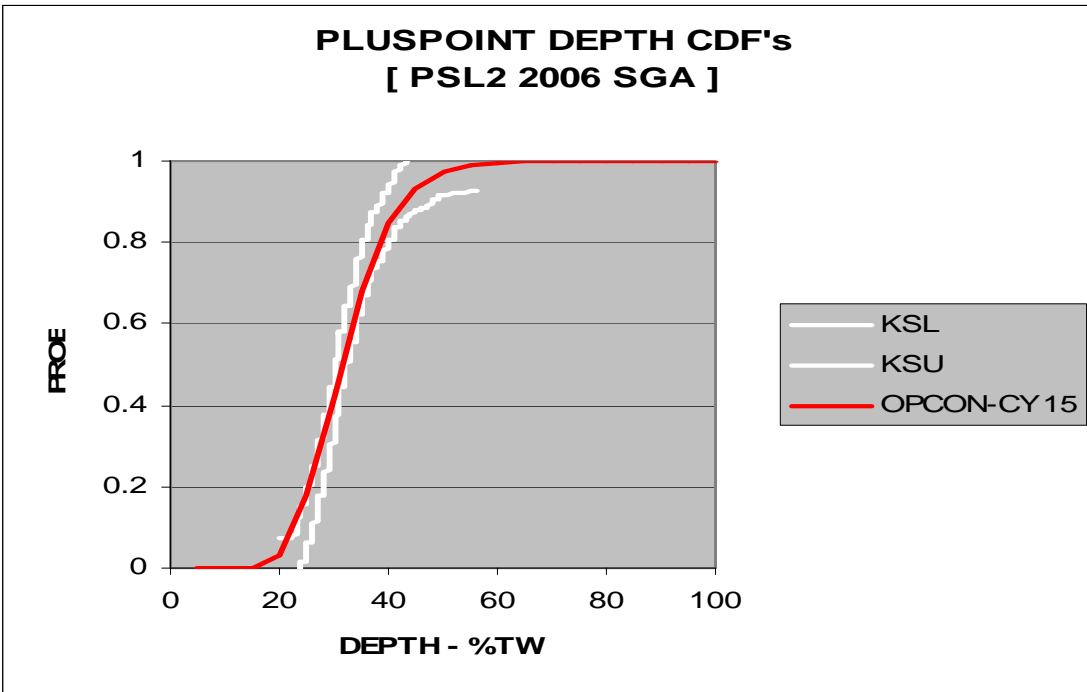


Figure 2 – Plus Point Depths

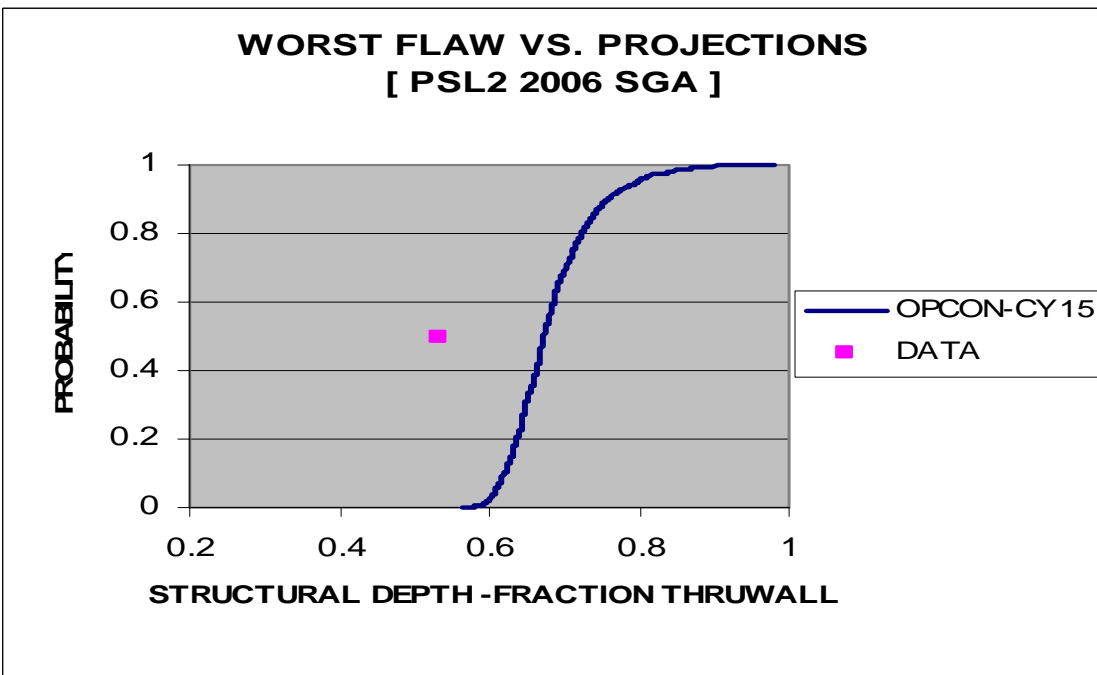
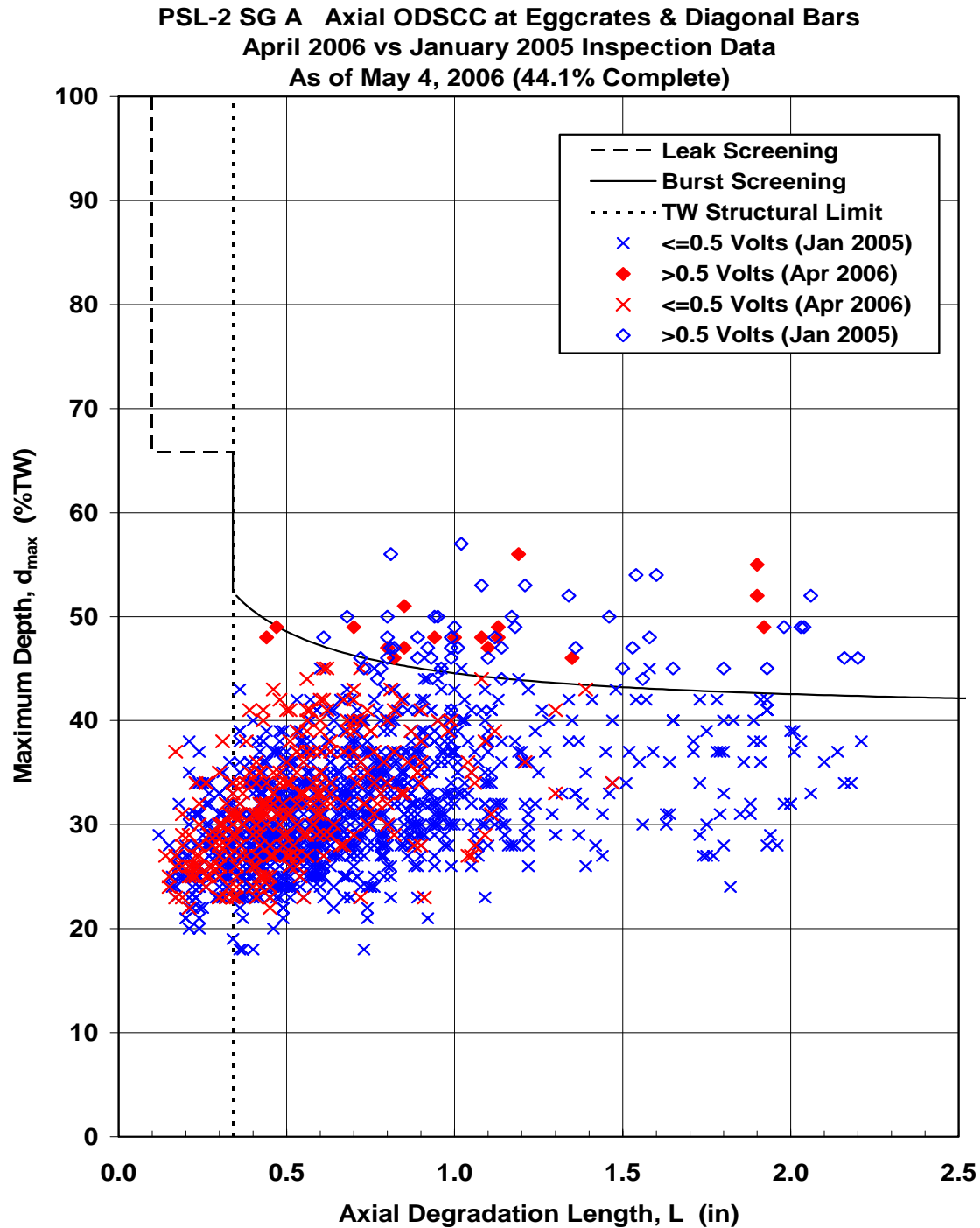


Figure 3 – Worst Flaw vs. Projections

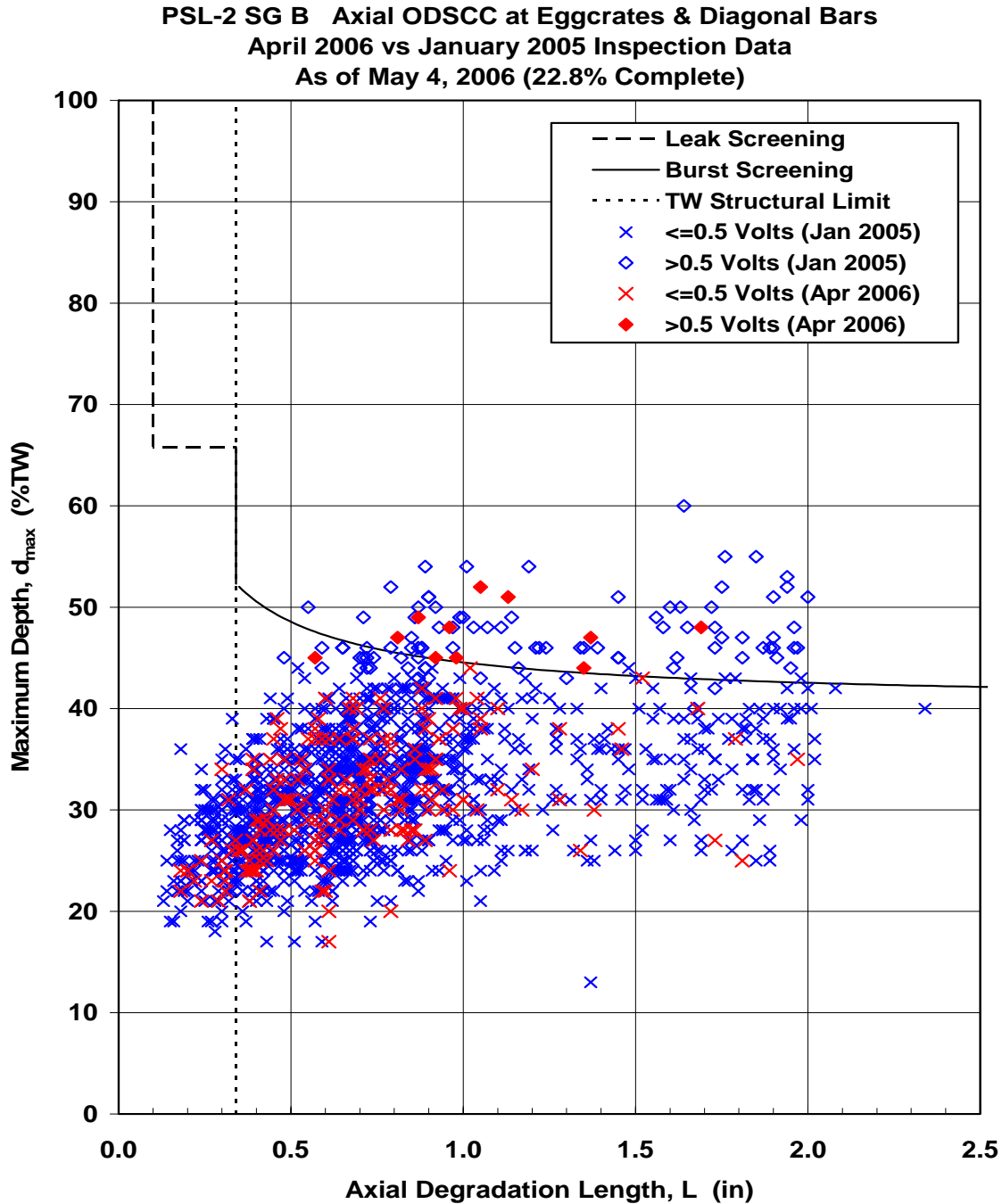
FPL REPLY TO:  
STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS  
PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
FLORIDA POWER AND LIGHT COMPANY  
SAINT LUCIE NUCLEAR PLANT UNIT 2  
DOCKET NO. 50-389



**Figure 4**



FPL REPLY TO:  
STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS  
PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
FLORIDA POWER AND LIGHT COMPANY  
SAINT LUCIE NUCLEAR PLANT UNIT 2  
DOCKET NO. 50-389



**Figure 5**