FPL

St. Lucie Unit 2

NRC Update
SL2-13 November 2001
Steam Generator Inspection Plans

PURPOSE OF TELECON

- Review SL2 Steam Generator Condition
- Review November 2001 Inspection Plans
- Ensure FPL Plans Address Staff Concerns

FPL STEAM GENERATOR PROGRAM

Committed to Safe Operation

Full Implementation of NEI 97-06, S/G Program Guidelines

Incorporate Industry Experience

Extensive Examination History at Unit2

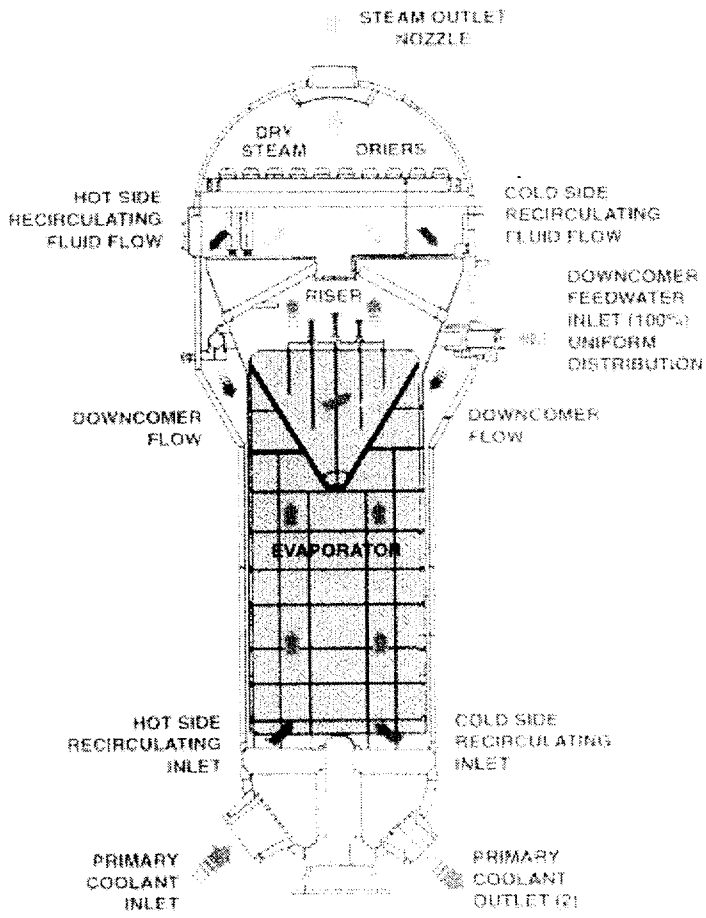
Conservative Approach

- In Situ Pressure Test at Last 3 Inspections

NRC Update - SL2-13 November 2001
Steam Generator Inspection

Design

- CE Model 3410 (Original inst.)
- 8411 Tubes / SG
- ~15.4 EFPY @ EOC 12
- A-600 HTMA Tubing
- CS Lattice Support System
- Explosive Tubesheet Expansion Joint
- Tubes Plugged
  - –SG A - 345 (4.1%)
  - –SG B - 307 (3.7%)
- T-Hot ~600°F



NRC Update - SL2-13 November 2001
Steam Generator Inspection

S/G Chemistry Meets Industry Practice

- All Volatile Treatment Since Start-up
- Dimethylamine 1 ppm (DMA) started in 1999
- Evaluating Additional Amines to Reduce Iron Transport
- Boric Acid Addition Since 1990
- Hydrazine @ 8x DO_2
- Ammonia @ ~ 7 ppm
- Elevated Feedwater pH ~9.8
- Continuous Blowdown
- Condensate Polishers Used on Startup

NRC Update - SL2-13 November 2001
Steam Generator Inspection

Primary to Secondary Leakage

- Technical Specification Requirements
- Procedures Incorporate EPRI Leak Guidelines
- Leakage Less than Detectable for Current Cycle
- Only Tube Leak - 3/85 Due to Wear at Batwing Contact
  - Leak Rate at Shutdown was 18 -20 GPD

NRC Update - SL2-13 November 2001
Steam Generator Inspection

Primary to Secondary Leak Monitoring

- S/G's Sampled Daily on Alternating Basis (SG A then B)
  - Gross Activity (TS Requires 3 Samples / 7 Days)
  - Tritium Activity
- Quarterly Sample - 4000 ml Dose Equivalent Iodine
- On-line Blowdown & Air Ejector Monitors
- Main Steam Line Radiation Monitors

NRC Update - SL2-13 November 2001
Steam Generator Inspection

Last Unit 2 Inspection Scope - April 2000

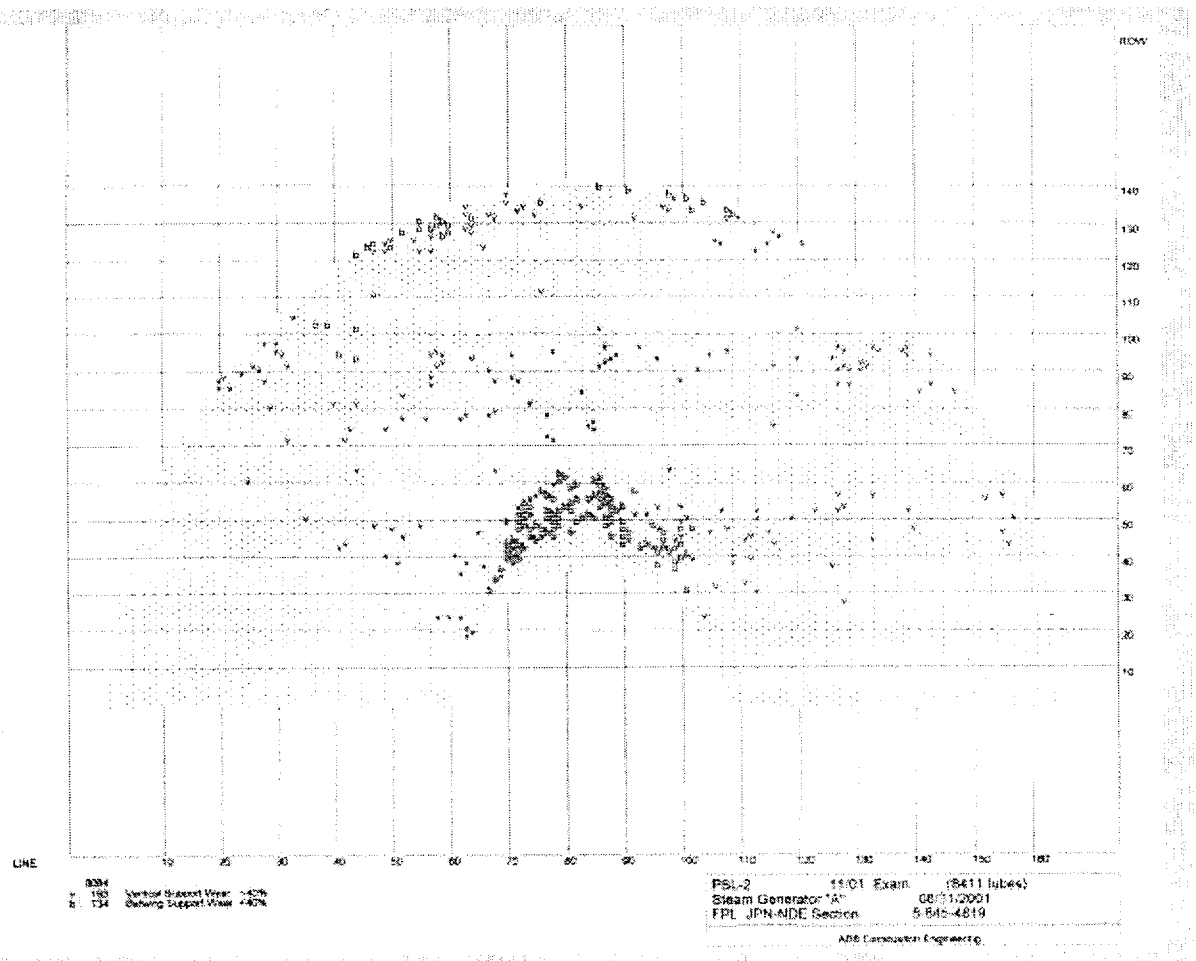
Bobbin Probe:	100% Full Length	
Plus Point Probe:	20% Row 1&2 U-Bends	
	20% Hot Leg Dents (Manufacturing related)	
	100% Hot Leg Top of Tubesheet	
	Free Span Indications that are New or Show Change	
Plugging:	Wear at U-Bend Supports	20 Tubes
	OD Axial Indications	28 Tubes
	ID Axial Indications	1 Tube
	OD Circumferential Indications	5 Tubes
		54 Tubes

In Situ Pressure Test - 5 OD Axial Indications (All Passed)

NRC Update - SL2-13 November 2001
Steam Generator Inspection

Wear at Diagonal Supports occurs near center stay cylinder.

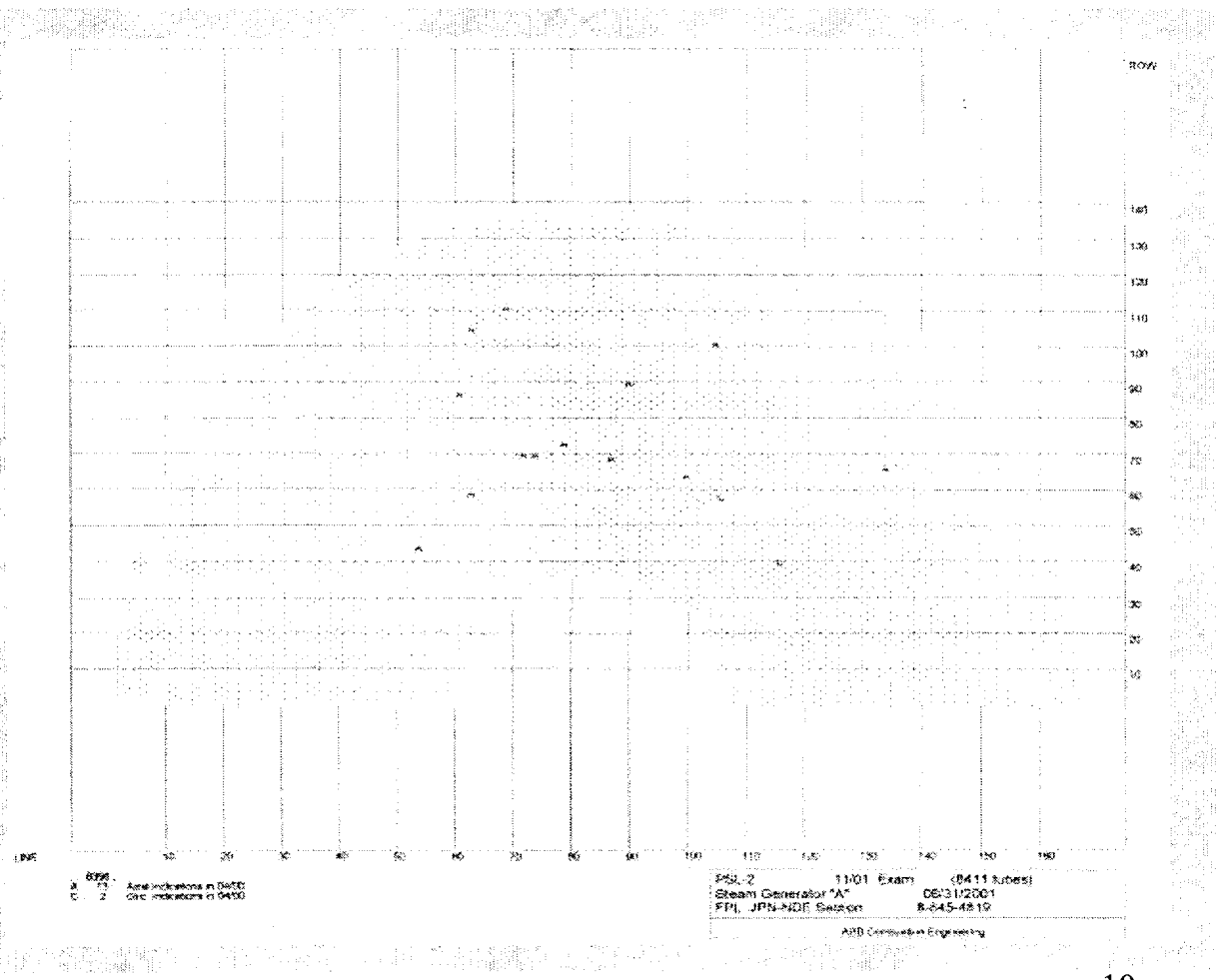
Wear at Vertical Supports occurs randomly.



NRC Update - SL2-13 November 2001
Steam Generator Inspection

Axial Indications occur at the top of tubesheet and eggcrate supports.

Circumferential Indications occur at the tube Expansion Transition.



NRC Update - SL2-13 November 2001
Steam Generator Inspection

Tube Plugging Trend Remains Low

Mechanism	Shop	10/84	4/85	4/86	10/87	2/89	10/90	4/92	2/94	10/95	4/97	11/98	4/00	Total
Preservice	50													50
Wear at U-Bend			265	28	17	19	31	36	6	11	8	6	20	447
Axial ODSCC At Tubesheet							8		1	5	66	13	14	107
Circ. ODSCC At Tubesheet									2		14	1	5	22
Axial ODSCC Eggcrates													14	14
Foreign Object Damage					1	1						3		5
Free Span Volumetric				2							2			4
Axial PWSCC At Tubesheet											1		1	2
Preventative											1			1
Free Span ODSCC														--
Totals	50		265[2]	30	18	20	39	36	9	16	92[1]	23	54	652

TOTAL PLUGS: S/G 2A = 345 (4.10%) S/G 2B = 307 (3.65%)

1. 4/97 Inspection was 1st use of Plus Point Rotating Probe Technology.
2. 4/85 Leak forced outage due to U-bend Wear at Diagonal Strap.

Impact of Free Span Cracking

Affects Most of CE Fleet but Few Tubes Require Plugging

Bobbin Probe - Effective Screening Tool

Rotating Probe Inspections of Affected Regions

Significant Outage Delays at Several CE Plants

Inspection Containment vs. Demonstrate Full Cycle Tube Integrity

NRC Update - SL2-13 November 2001
Steam Generator Inspection

History of Free Span Evaluations at St. Lucie 2

1993 - Upper Bundle Freespan Tube Rupture at a CE Plant
Deposits & Concentration of Contaminants

1994 - ATHOS Evaluation - Identify High Deposit Potential Regions

1994 - MRPC 376 Tubes/~1400 Spans in High Potential Regions

1997 - Plus Point Inspect All Freespan Bobbin Indications

S/G 2A - 89 S/G 2B - 71

~75% Traceable to 1982 Preservice Data

Remainder Traceable to 1987 Data

1 Volumetric Indication Plugged

No Cracking Detected

1998 to Present - Plus Point Inspect Indications that Show Change or Growth from Prior Inspection

NRC Update - SL2-13 November 2001 Steam Generator Inspection

November 2001 Inspection Scope

Bobbin Probe:	100% Bobbin Probe Full Length
Plus Point Probe:	100% of Hot Leg Top of Tubesheet 30% of Row 1&2 U-bends 30% of Hot Leg Dents Free Span Indications (New or Show Change)
In Situ Test:	Screen / Test per EPRI Guidance

Contingency Plan for Free Span Cracking

NRC Update - SL2-13 November 2001
Steam Generator Inspection

Overview Of Contingency Plan

Presented to NRC prior to SL2-10, 11 & 12 Inspections

Sampling Methodology to Optimizes Use of Resources

Statistical Basis for Operational Assessment

Reduces Risk of not Inspecting Affected Areas

Incorporates Both Site & Industry Experience

NRC Update - SL2-13 November 2001
Steam Generator Inspection

STEP 1 - Free Span Cracking Plan

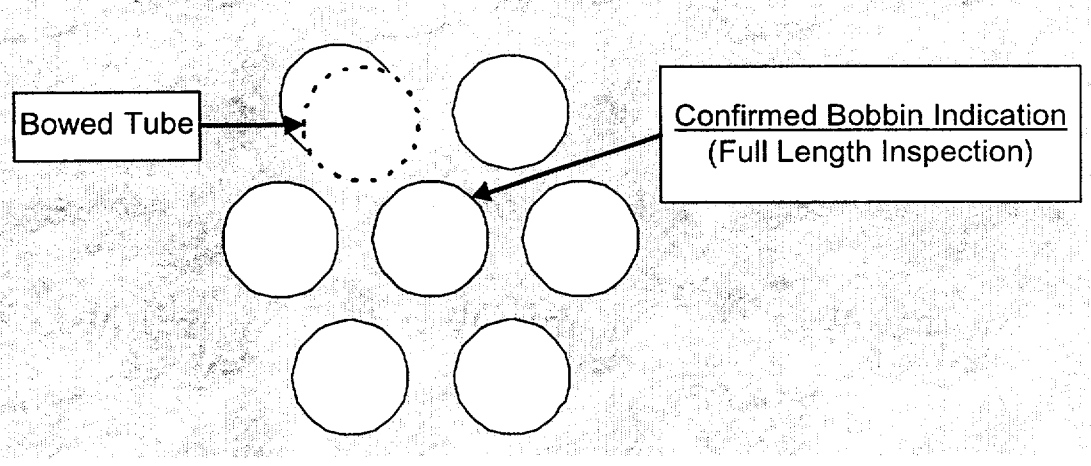
Screen 100% of Bundle with Bobbin Coil

Plus Point Inspect Bobbin Indications that are New or Show Change

If Cracking is Confirmed:

Inspect Remainder Of Tube On Side With Crack

Inspect 6 Neighbor Tubes At Same Span with Confirmed Cracks



NRC Update - SL2-13 November 2001
Steam Generator Inspection

STEP 2 - Free Span Cracking Plan

Evaluate Locations of All Confirmed Free Span Cracks

Determine Applicable Inspection Scenario

Select Appropriate Sample Scheme

Maximize Use of Resources

Maximize Potential to Demonstrate Full Cycle Tube Integrity

SCENARIO	DEGREE	CLUSTERED	# CRACKS	SAMPLE SCHEME
CASE 1	NONE	N/A	0	NONE
CASE 2	MINIMAL	YES	<15	LHS
CASE 3	MINIMAL	NO	<15	LHS
CASE 4	MODERATE	YES	15-50	IMPORTANCE
CASE 5	MODERATE	NO	15-50	REDUCED LHS
CASE 6	SEVERE	YES	>50	IMPORTANCE
CASE 7	SEVERE	N0	>50	SYSTEMATIC*

LHS – Latin Hypercube Sampling
*Optimized to support bobbin POD

NRC Update - SL2-13 November 2001
Steam Generator Inspection

Latin Hypercube Sampling Scheme Most Likely Scenario

Proven Efficiency vs. Random Sampling

Provides Optimal Coverage vs. Inspection Cost

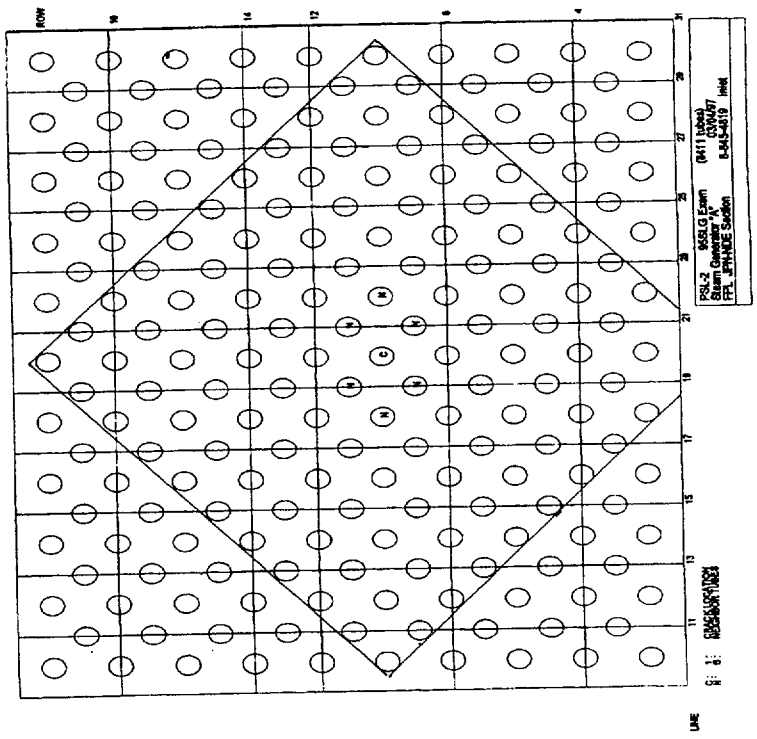
Widely Used Strategy in Monte-Carlo Simulation

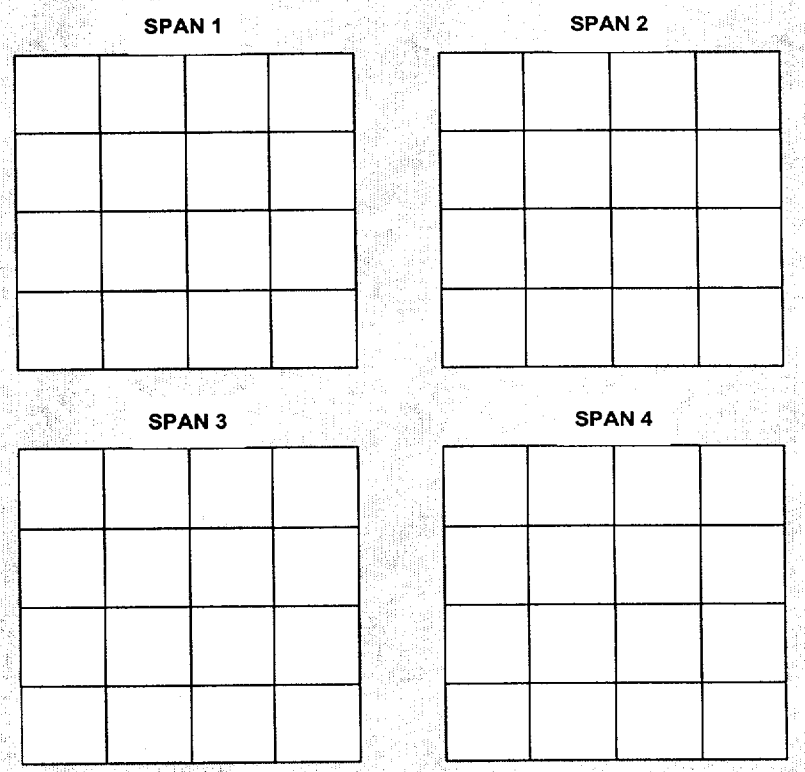
Good Approach with High Uncertainty in Risk Stratification

Robust Approach

NRC Update - SL2-13 November 2001
Steam Generator Inspection

LHS Example: Generate 11 X 11 Tube Box Around Tubes w/Crack
Sample Affected Region to Cover All Possibilities





NRC Update - SL2-13 November 2001
Steam Generator Inspection

Summary

Meet or Exceed Industry Guidance

Incorporate Site & Industry Experience

Provide Reasonable Assurance of Tube Integrity

Identify & Address Staff Concerns

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

December 6, 2001

The following discussion points have been prepared to facilitate the phone conference arranged with the St. Lucie licensee to discuss the results of the steam generator (SG) tube inspections to be conducted during the upcoming St. Lucie Plant, Unit 2 refueling outage. This phone call is scheduled to occur towards the end of the planned SG tube inspection interval, but before the unit exits its refueling outage.

It is the staff's expectation that any significant results or relevant trends discussed during the phone conference, as well as any materials provided by your staff to assist us during the phone conference in the understanding of the SG tube results, will be included in one of the special reports required by the plant Technical Specifications.

1. Discuss whether any primary to secondary leakage existed in this unit prior to shutdown.

   Response: Primary to secondary leakage is less than detectable for Cycle 12.

2. Discuss the results of secondary side hydrostatic tests.

   Response: None planned for this refueling outage.

3. For each steam generator, provide a general description of areas examined, including the expansion criteria utilized and type of probe used in each area.

   Response:

	Examination Scope	% Complete @ 0400
Bobbin Probe	*100% Full Length*	*66%*
Plus Point Probe	*100% Hot Leg Tubesheet*	*91%*
	30% Row 1&2 U-bends	*80%*
	30% Hot Leg Dents	*95%*

   Expansion criteria will be in accordance with Plant Technical Specifications and NEI 97-06, Steam Generator Program Guidelines (i.e., EPRI S/G Examination Guidelines).

4. For analyzed eddy current results, describe bobbin indications (those not examined with rotating pancake coil (RPC) and RPC/Plus Point/Cecco indications. Include the following information in the discussion: location, number, degradation mode, disposition, and voltages/depths/lengths of significant indications.

   Response: Bobbin indications not examined with rotating probe coils include approximately 500 mechanical wear indications 20-39% through-wall located at the u-bend support structures. A small number of wear indications are also present at the upper eggcrate tube supports. These

indications range in voltage from <0.3 to about 2.2 volts. Mechanical wear indications are depth sized with qualified and site validated bobbin techniques and plugged based on the Technical Specification limit of 40% through-wall penetration. Wear indications that approach the Technical Specification limit are screened for preventative plugging based on observed growth rates. Bobbin indications at other locations (i.e., freespans) have been examined with rotating probe techniques at prior inspections, and are reviewed in the current inspection for evidence of change or growth, which would require a rotating probe examination in the current inspection.

Plus Point rotating probe indications are summarized in the following table. All corrosion-type indications will be plugged, and circumferential indications will be stabilized.

Type	Mode	Location	No.	Voltages	Depths	Lengths
Axial	OD	Eggcrate	74	0.14 - 0.60	24-60%	0.16-1.68"
Axial	OD	Sludge Pile	6	0.09 – 0.55	24-75%	0.13 – 0.30"
Axial	ID	Sludge Pile	3	1.78 - 3.35(1)	86-99%	0.25 – 0.43"
Axial	ID	Tubesheet	1	0.32 – 0.38	58-82%	0.16 – 0.20"
Circ	OD	Tubesheet	7	0.12 – 0.42	19-94%	25-123 Degrees
Vol	OD	Eggcrate	2	0.23 – 0.27	47-85%	0.20 - 0.45"

(1) Indication depth and voltage estimates influenced by a dent. Origin is assumed to be ID.

5. Describe repair/plugging plans for the SG tubes that meet the repair/plugging criteria.

   Response: *Mechanical wear will be depth sized and plugged based on the Technical Specification plugging limit. Corrosion-type indications (i.e., above table) will be plugged on detection.*

6. Discuss the previous history of SG tube inspection results, including any "look backs" performed.

   Response: *Review of historical data is on going and incomplete at this time. In general, mechanical wear indications are examined at each refueling outage and may be present for many inspections. Corrosion type flaws may be present in prior inspection data near the threshold of detection as their probability of detection increases with flaw amplitude. In situ pressure testing has been conducted during the prior 3 inspections and has demonstrated that NDE and tube integrity estimates are conservative.*

7. Discuss, in general, the new inspection findings.

   Response: *The number and sizes of indications are generally within the bounds of those observed in recent inspections with two exceptions. First, a dent just above the hot leg tubesheet appears to have developed an axial indication that is most likely ID in origin due to the stress associated with the dent. This indication is distorted by the dent signal, but appears to be near through-wall and less than ½" in length. This indication will be situ pressure tested. Second, the number of axial indications at eggcrate tube supports increased from 15 in the prior inspection to about 74 to date in this inspection. These indications do not appear to challenge tube integrity performance criteria. However, in situ pressure testing is planned for a sample to further demonstrate that NDE and tube integrity estimates are conservative. Additional indications will be included based on screening results.*

8. Describe in situ pressure test plans and results, if applicable and available, including tube selection criteria.

   Response: *A total of 18 in situ pressure tests have been conducted at St. Lucie Unit 2 during the past 3 inspections. All tubes tested met the tube integrity performance criteria of NEI 97-06, Steam Generator Program Guidelines. Based on screening work to date, indications observed in this inspection appear to be consistent with prior results with the exception of the axial indications that are coincident with dents just above the tubesheet, and the increase in axial indications at eggcrate tube supports. Test candidates are profiled based on detailed Plus Point probe examinations. The profiles are used with lower bound material properties, corrected for temperature, to calculate burst pressures and accident induced leakage rates. Candidates are selected based on a minimum calculated burst pressure of 4305 psi and/or projected leakage. Test pressures are developed to meet the tube integrity performance criteria of NEI 97-06, Steam Generator Program Guidelines. Test configuration will utilize the Westinghouse (formerly ABB/CE) test tooling with capability for local and full tube testing. In the event that axial indications at eggcrate supports do not exceed screening criteria, a sample of indications will be in situ tested to demonstrate that tube integrity performance criteria are maintained.*

9. Describe tube pull plans and preliminary results, if applicable and available; include tube selection criteria.

   Response: *There are no plans for a tube pull in this inspection.*

10. Discuss the assessment of tube integrity for the previous operating cycle.

    Response: *This work is still on going and will include in situ pressure testing.*

11. Discuss the assessment of tube integrity for next operating cycle.

    Response: *This work is still on going and will include in situ pressure test results.*

12. Provide the schedule for steam generator-related activities during the remainder of the current outage.

    Response: *All inspection and tube plugging activities will be concluded by approximately December 9, 2001.*

13. Discuss what steps have been taken, or will be taken, in response to the lessons learned from the Indian Point Unit 2 tube failure. In addition, please be prepared to discuss the following:

    Response: *FPL has participated in NEI/NRC meetings on this subject. Low row u-bend noise at St. Lucie Unit 2 has been determined to be less than noise levels encountered at IP-2, and less than those encountered with the EPRI qualification data set for low row u-bend technique qualification. Therefore, site-specific validation of EPRI techniques is considered appropriate for low row u-bend inspection at St. Lucie Unit 2. The use of high frequency techniques will be*

considered in the event that higher than expected noise levels are encountered.

a) Discuss the actions that are taken in response to identifying a new degradation mechanism

Response: *A new degradation mechanism would be entered into the Plant Corrective Action System for appropriate evaluation. Examination planning includes appropriate expansion criteria and the use of "diagnostic examinations" to ensure potential degradation is understood and appropriately addressed. Results in this area remain under review.*

b) Discuss the actions taken to ensure that data noise levels are acceptable, and

Response: *St. Lucie Unit 2 examination data has been reviewed against the EPRI generic technique qualification sample set data used to ensure that the use of the techniques is appropriate (i.e., site specific validation). Guidance on data quality and noise levels is provided in FPL data analysis guidelines, and an independent Qualified Data Analyst samples the examination data to ensure that data quality is acceptable.*

Isolated and discrete ID indications at the U-bend apex, if detected, will be considered for preventative plugging based on recent experience in Westinghouse and Combustion Engineering design steam generators.

c) Address data quality issues and the need for criteria to address data quality.

Response: As required by Industry guidance, data quality issues are addressed through site specific validation of techniques that are used for inspection at St. Lucie Unit 2. Guidance on data quality and noise levels is also provided in FPL data analysis guidelines. Further, an independent Qualified Data Analyst samples the examination data to ensure that data quality is acceptable.

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

December 7, 2001

The following discussion points have been prepared to facilitate the phone conference arranged with the St. Lucie licensee to discuss the results of the steam generator (SG) tube inspections to be conducted during the upcoming St. Lucie Plant, Unit 2 refueling outage. This phone call is scheduled to occur towards the end of the planned SG tube inspection interval, but before the unit exits its refueling outage.

It is the staff's expectation that any significant results or relevant trends discussed during the phone conference, as well as any materials provided by your staff to assist us during the phone conference in the understanding of the SG tube results, will be included in one of the special reports required by the plant Technical Specifications.

1. For each steam generator, provide a general description of areas examined, including the expansion criteria utilized and type of probe used in each area.

Response:

	Examination Scope	% Complete @ 0400
Bobbin Probe	*100% Full Length*	*93%*
Plus Point Probe	*100% Hot Leg Tubesheet*	*97%*
	30% Row 1&2 U-bends	*86%*
	30% Hot Leg Dents	*95%*

Expansion criteria will be in accordance with Plant Technical Specifications and NEI 97-06, Steam Generator Program Guidelines (i.e., EPRI S/G Examination Guidelines).

2. For analyzed eddy current results, describe bobbin indications (those not examined with rotating pancake coil (RPC) and RPC/Plus Point/Cecco indications. Include the following information in the discussion: location, number, degradation mode, disposition, and voltages/depths/lengths of significant indications.

Plus Point rotating probe indications are summarized in the following table. All corrosion-type indications will be plugged, and circumferential indications will be stabilized.

Type	Mode	Location	No.	Voltages	Depths	Lengths
Axial	*OD*	*Eggcrate*	*75*	*0.14 - 0.60*	*24-60%*	*0.16-1.68"*
Axial	*OD*	*Sludge Pile*	*18*	*0.09 – 0.55*	*24-75%*	*0.13 – 0.30"*
Axial	*ID*	*Dents*	*4*	*1.43 - 3.35(1)*	*44-99%*	*0.20 – 0.43"*
Axial	*ID*	*Tubesheet*	*1*	*0.32 – 0.38*	*58-82%*	*0.16 – 0.20"*
Circ	*OD*	*Tubesheet*	*9*	*0.12 – 0.42*	*19-94%*	*25-123 Degrees*
Vol	*OD*	*Eggcrate/TS*	*2*	*0.23 – 0.27*	*47-85%*	*0.20 - 0.45"*

(1) Indication depth and voltage estimates influenced by a dent. Origin is assumed to be ID.

St. Lucie Unit 2 Steam Generator Dent Inspection Results					
Program Description	**Dents Inspected**		**Dents Defective**		**Comments**
	SG 2A	SG 2B	SG 2A	SG 2B	
Hot Leg 30% Sample Dents 5> Volts	39	50	0	0	
All Dents within 3" of Hot Leg Top of Tubesheet (+ Point inspected)	40	39	3	0	All defects located in periphery tubes
All Dents Hot Leg Top of Tubesheet +3" to 1st Tube Support	27	20	1	0	Defective Dent at TSH+24"
All Dents > 5 Volts from 1st Tube Support to Bend	59	54	TBD	TBD	
Dents in Cold Leg Periphery Tubes: SG 2A = 20, SG 2B = 24	16	15	0	0	
Review of All Dents < 5 Volts from Hot Leg Tubesheet to Bend	319	241	TBD	TBD	Plus Point Inspection of Distorted Dent Indications

PRELIMARY IN SITU TEST CANDIDATE LIST					
S/G	**Row**	**Line**	**Location**	**FLAW TYPE**	**TEST REASON**
A	139	95	TSH+0.82	ASI-ID / Dent	Burst <3NODP / Leak TBD / Voltage
A	140	80	TSH+0.86	ASI-ID / Dent	Burst <3NODP / Leak TBD / Voltage / Depth
A	20	2	TSH+0.83	ASI-ID / Dent	Burst <3NODP / Leak 0.040 gpm / Voltage / Depth
A	39	103	TSH-1.82	ASI-ID	Burst <3NODP / Leak 0.032 gpm / Multiple
"	"	"	TSH-2.05	ASI-ID	Burst <3NODP / Leak 0.011 gpm / Multiple
A	70	76	TSH+0.56	ASI-OD	Burst <3NODP / Leak TBD
B	41	115	TSH-0.03	CSI-OD	Length / Depth / Leak 0.184 gpm
B	53	61	TSH-0.12	CSI-OD	Depth / Leak 0.029 gpm
B	66	106	01H+0.65	ASI-OD	Lowest Eggcrate Burst 4945 psi
A	117	73	01H-0.38	ASI-OD	Length
B	64	108	01H-0.37	ASI-OD	Longest Length at Eggcrate
B	47	51	01H-.025	ASI-OD	Long Length / Multiple Flaw
"	"	"	01H+0.25	ASI-OD	Long Length / Multiple Flaw
B	7	53	05H+0.56	ASI-OD	Voltage

Results as of 0400 on 12/10/01. DRAFT / UNVERIFIED
Page 1 of 3

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

December 10, 2001

The following discussion points have been prepared to facilitate the phone conference arranged with the St. Lucie licensee to discuss the results of the steam generator (SG) tube inspections to be conducted during the upcoming St. Lucie Plant, Unit 2 refueling outage. This phone call is scheduled to occur towards the end of the planned SG tube inspection interval, but before the unit exits its refueling outage.

It is the staff's expectation that any significant results or relevant trends discussed during the phone conference, as well as any materials provided by your staff to assist us during the phone conference in the understanding of the SG tube results, will be included in one of the special reports required by the plant Technical Specifications.

1. For each steam generator, provide a general description of areas examined, including the expansion criteria utilized and type of probe used in each area.

Response:

	Examination Scope	% Complete @ 0400
Bobbin Probe	*100% Full Length*	*100%*
Plus Point Probe	*100% Hot Leg Tubesheet*	*100%*
	30% Row 1&2 U-bends	*100%*
	30% Hot Leg Dents	*100%*

Remaining Items:

- *Diagnostic testing*
- *In Situ Pressure Testing*
- *Tube plugging*

Update on two issues:

- *Axial indications at dents are OD based on additional review of data (i.e., 100 kHz)*
- *Axial indications at dents were present in prior inspection but at lower level*

2. For analyzed eddy current results, describe bobbin indications (those not examined with rotating pancake coil (RPC) and RPC/Plus Point/Cecco indications. Include the following information in the discussion: location, number, degradation mode, disposition, and voltages/depths/lengths of significant indications.

Plus Point rotating probe indications are summarized in the following table. All corrosion-type indications will be plugged, and circumferential indications will be stabilized.

Type	*Mode*	*Location*	*No.*	*Voltages*	*Depths*	*Lengths*
Axial	*OD*	*Eggcrate*	*257*	*0.14 - 0.60*	*24-60%*	*0.16-1.94"*
Axial	*OD*	*Sludge Pile*	*24*	*0.09 – 0.55*	*24-75%*	*0.13 – 0.30"*
Axial	*OD*	*Dents*	*6*	*1.43 - 3.35(1)*	*44-99%*	*0.20 – 0.43"*
Axial	*ID*	*Tubesheet*	*2*	*0.32 – 0.38*	*58-82%*	*0.16 – 0.20"*
Circ	*OD*	*Tubesheet*	*12*	*0.12 – 0.42*	*19-94%*	*25-123 Degrees*
Vol	*OD*	*Eggcrate / TS*	*1/1*	*0.23 – 0.27*	*47-85%*	*0.20 - 0.45"*

(1) Indication depth and voltage estimates influenced by a dent.

St. Lucie Unit 2 Steam Generator Dent Inspection Results		
Plus Point Inspection of Dents	**Dents Defective**	**Location**
All Hot Leg Dents Top of Tubesheet to 1st Support	4 OD Axial	3 at TSH + ~1" , 1 at TSH+24" 22 – 44 Volts
All Hot Leg Dents 1st Eggcrate to Hot Leg Bend 5 > Volts	1 OD Axial	5H+3.8" 3.5 Volts
Review All Dents 1st Tube Support to Hot Bend < 5 Volts	0	Plus Point Inspection of Distorted Dent Indications and all dents at Eggcrates
All Dents Row 1-18 U-Bends	1 OD Axial	Row 13 U-Bend 6.1 Volts
Majority of Cold Leg Dents at Top of Tubesheet	0	

Preventatively plug all dents >10 Volts below 1st tube support on Hot Leg

PRELIMARY IN SITU TEST CANDIDATE LIST						
S/G	Row	Line	Location	FLAW TYPE	TEST REASON	RESULT
A	139	95	TSH+0.82	ASI-OD / Dent	Burst <3NODP / Leak TBD / Voltage	Passed
A	140	80	TSH+0.86	ASI-OD / Dent	Burst <3NODP / Leak TBD / Voltage / Depth	Full Tube Required
A	20	2	TSH+0.83	ASI-OD / Dent	Burst <3NODP / Leak 0.040 gpm / Voltage / Depth	Full Tube Required
A	39	103	TSH-1.82	ASI-ID	Burst <3NODP / Leak 0.032 gpm / Multiple	Passed
"	"	"	TSH-2.05	ASI-ID	Burst <3NODP / Leak 0.011 gpm / Multiple	Passed
A	70	76	TSH+0.56	ASI-OD	Burst <3NODP / Leak	Passed
A	49	57	TSH+0.23	ASI-OD	Depth	Passed
A	55	113	TSH+24.6	ASI-OD / Dent	Voltage	Full Tube Required
A	117	61	1H-0.22	ASI-OD	Burst <3NODP / Longest Length	Passed
A	8	144	3H+0.80	ASI-OD	Length	Passed
A	109	65	1H+0.16	ASI-OD	Length	Passed
B	41	115	TSH-0.03	CSI-OD	Length / Depth / Leak 0.184 gpm	
B	53	61	TSH-0.12	CSI-OD	Depth / Leak 0.029 gpm	
B	58	88	2H+0.19	ASI-OD	Burst <3NODP / Max Leakage	
B	64	108	1H-0.37	ASI-OD	Length	
B	47	51	1H-.025	ASI-OD	Length / Multiple Flaw	
"	"	"	1H+0.25	ASI-OD	Long Length / Multiple Flaw	
B	70	78	TSH+0.31	ASI-OD	Burst <3NODP / Depth	
B	64	108	1H-0.37	ASI-OD	Length	
B	83	111	TSH+0.20	VOL-OD	Depth	

NOTE: S/G 2B Test List is still preliminary

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

December 11, 2001 – 3 PM

Overview:
FPL has participated in three phone conferences with NRC to discuss on-going inspection results for St. Lucie 2 steam generators. During our 1st phone call on Thursday, portions of the inspection program were only 65% complete. In our discussions on Friday the inspection was about 90% complete, but there were several hundred outstanding diagnostic Plus Point inspections that were required to finalize tube repair listing. Over the weekend, the inspection was essentially completed and most diagnostic tests were completed which increased the total tubes to be plugged. NRC identified several issues and requested further explanation in our phone call scheduled for today. The following discussion and attachments provide our response to these issues. For reference, the information provided to NRC for our discussion yesterday is provided as Attachment 3.

Issue 1: Provide eddy current graphics and discuss the evolution of the worst indications detected in dents (See Attachment 1 – 13 Pages).

Issue 2: How is the lessons learned information being used in today's inspection?

Issue 3:

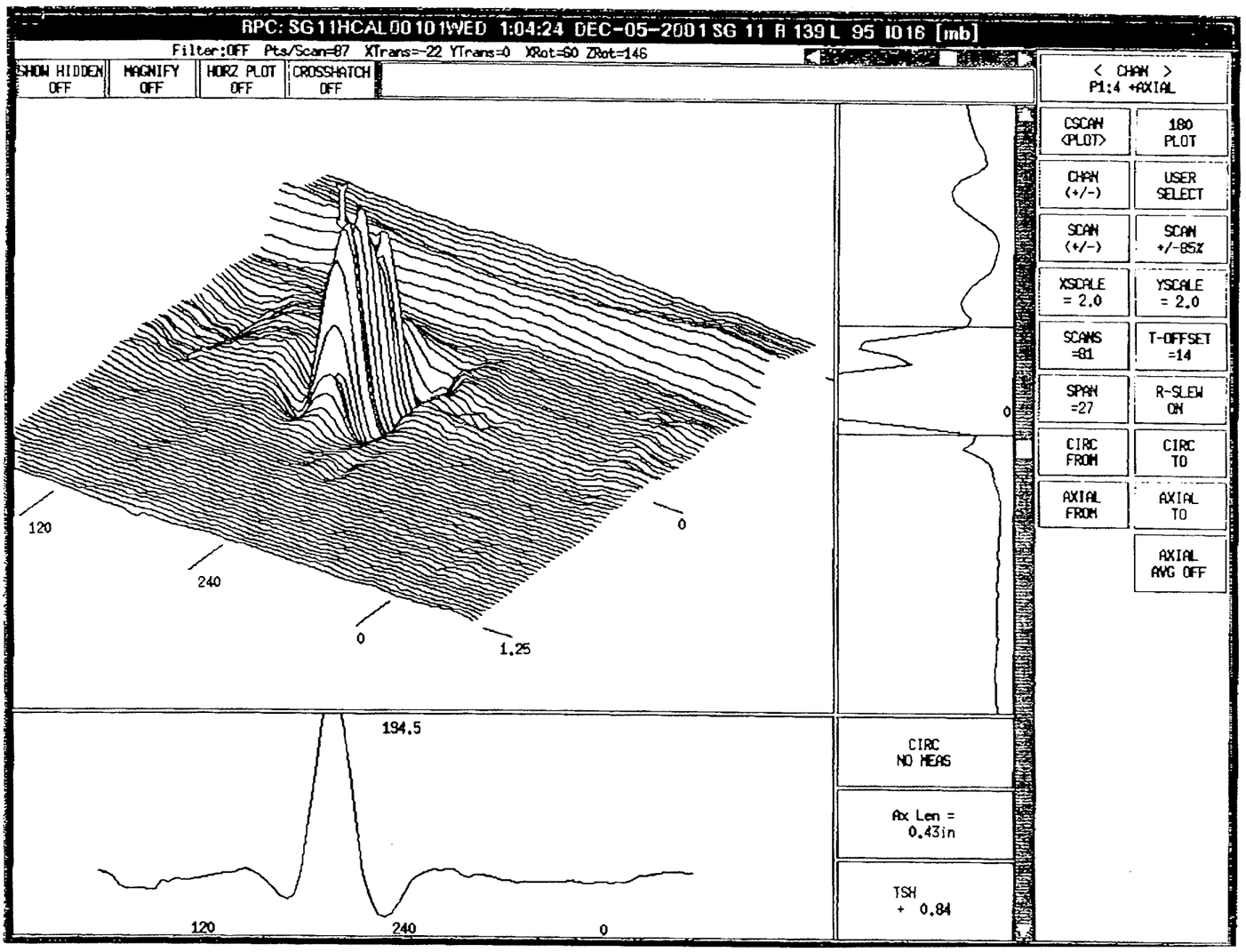
a. How is the scope of inspection for dents <3 volts sufficient?
b. How is the scope inspection of U-bends greater than row 18 sufficient?
c. How is the scope inspection of cold leg areas sufficient?

Issue 4: Discuss why plugging dents 10 volts and greater for dents between the hot leg tubesheet and the first support is adequate. Discuss what the scope of inspections has been (See Attachment 2).

Issue 5: Explain why the description of cold leg top of tubesheet dents is different today from what was described on Friday.

A4.1

(2)


RPC: SG11HCAL00101WED 1:04:24 DEC-05-2001 SG 11 A 139 L 95 1016 [mb]
Filter:OFF Pts/Scan=87 XTrans=-22 YTrans=0 XRot=80 ZRot=146
SHOW HIDDEN OFF
MAGNIFY OFF
HORZ PLOT OFF
CROSSHATCH OFF
120
240
0
0
1.25
0
194.5
120
240
0
< CHAN >
P1:4 +AXIAL
CSCAN <PLOT>
180 PLOT
CHAN (+/-)
USER SELECT
SCAN (+/-)
SCAN +/-85%
XSCALE = 2.0
YSCALE = 2.0
SCANS =81
T-OFFSET =14
SPAN =27
R-SLEW ON
CIRC FROM
CIRC TO
AXIAL FROM
AXIAL TO
AXIAL AVG OFF
CIRC NO MEAS
Ax Len = 0.43in
TSH + 0.84

A H 1

(3)

Eddynet98: Analysis [C]- 1989,90 M2691 as qir [MB]

File Analysis System Tools Layout Add Displays Help

Tube Comment: MDD

SG11HCAL00132 THU 10:10:07 APR-27-2000 SG 11 ROW 139 LIN 95 I158

< Lmrks >	P2	300	+Axial	10	20	Locator	P2:5	300	G1	C5	+Axial
Clear	G1	C5	Vert	G1	C1	Vert	0.35 v/d		span 28		rot 221

1.48

TSH

-1.48

13954

Vpp MxR Vmx GAn 180

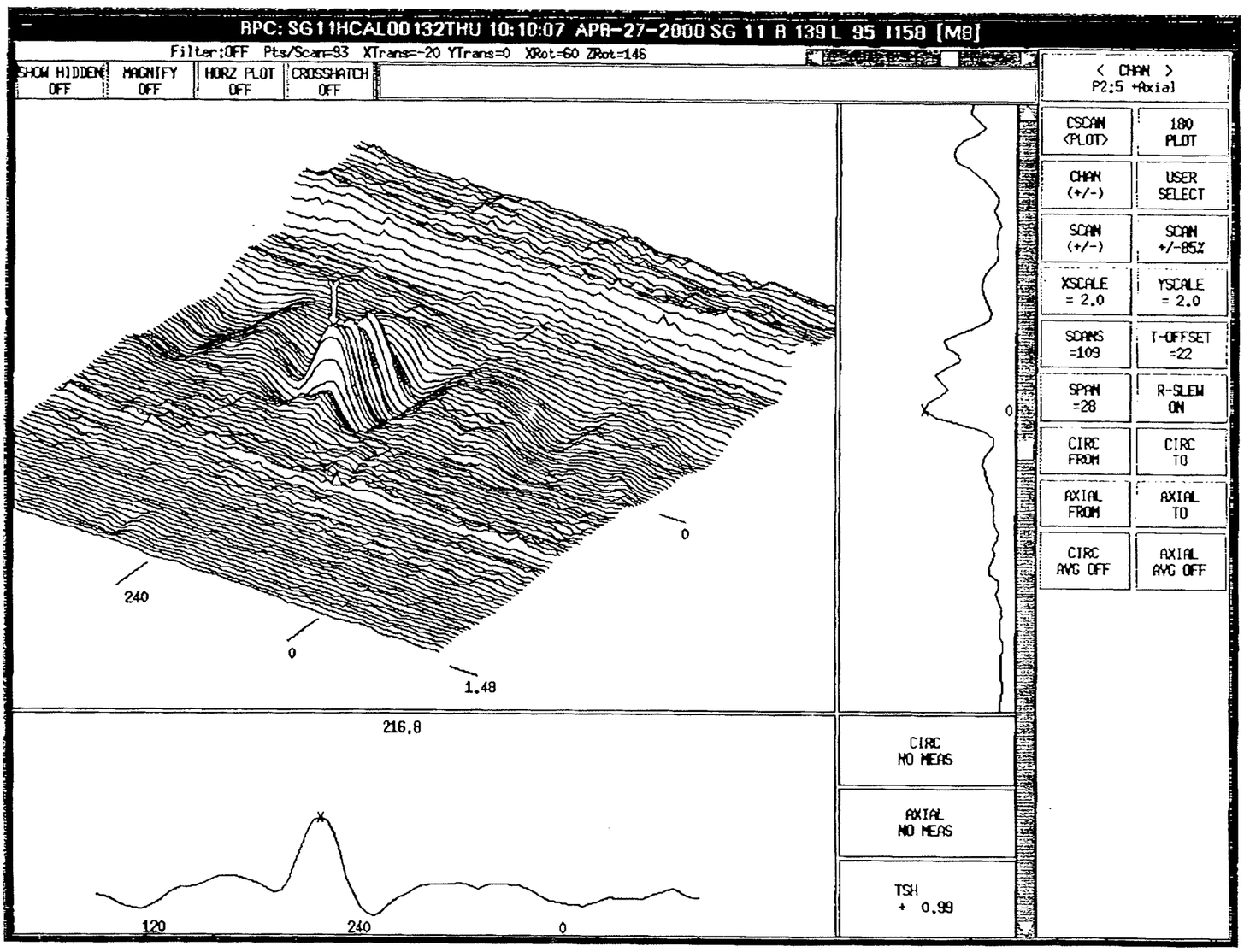
2.52 volts 17 deg RPC

TSH + 0.99

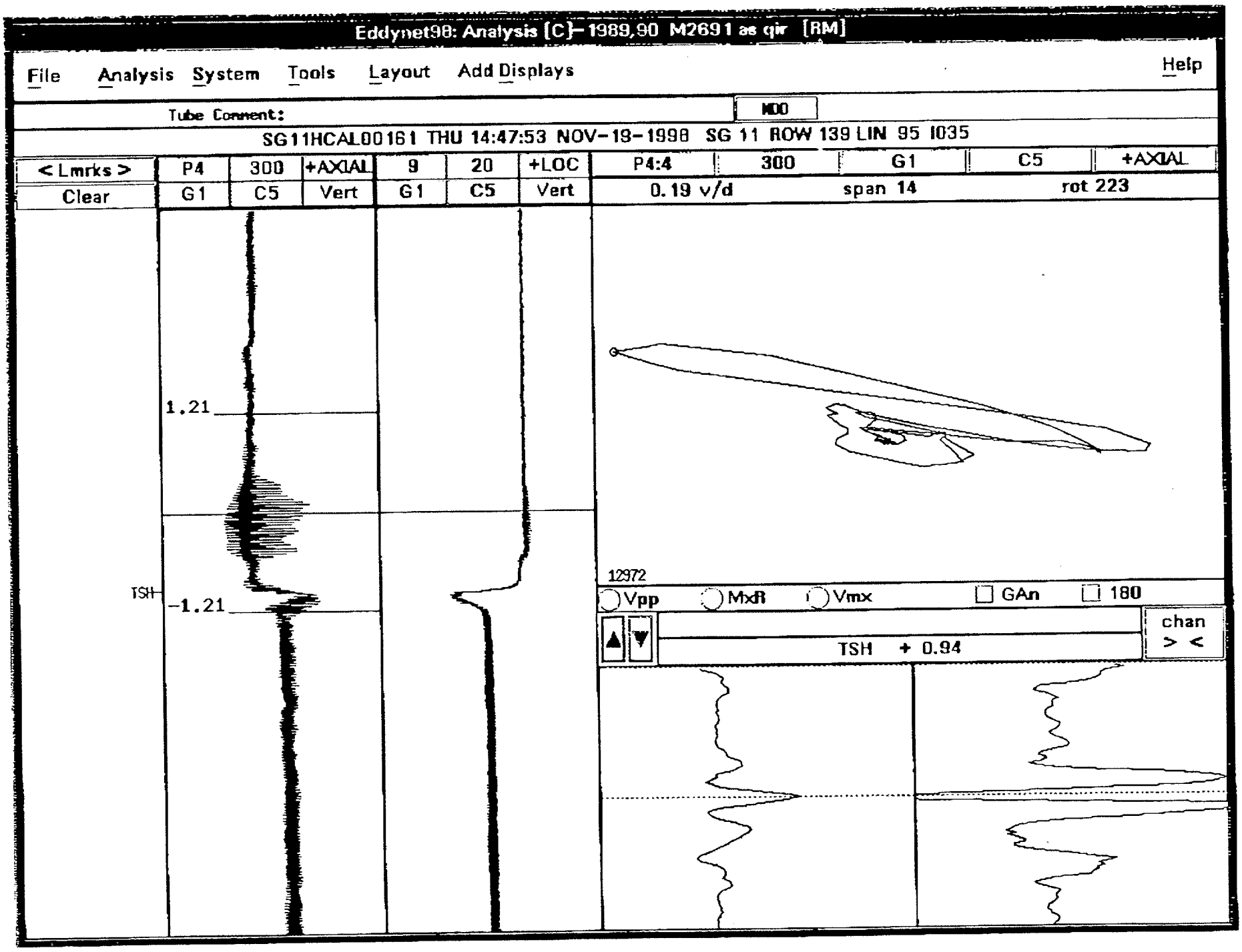
chan > <

A # 1

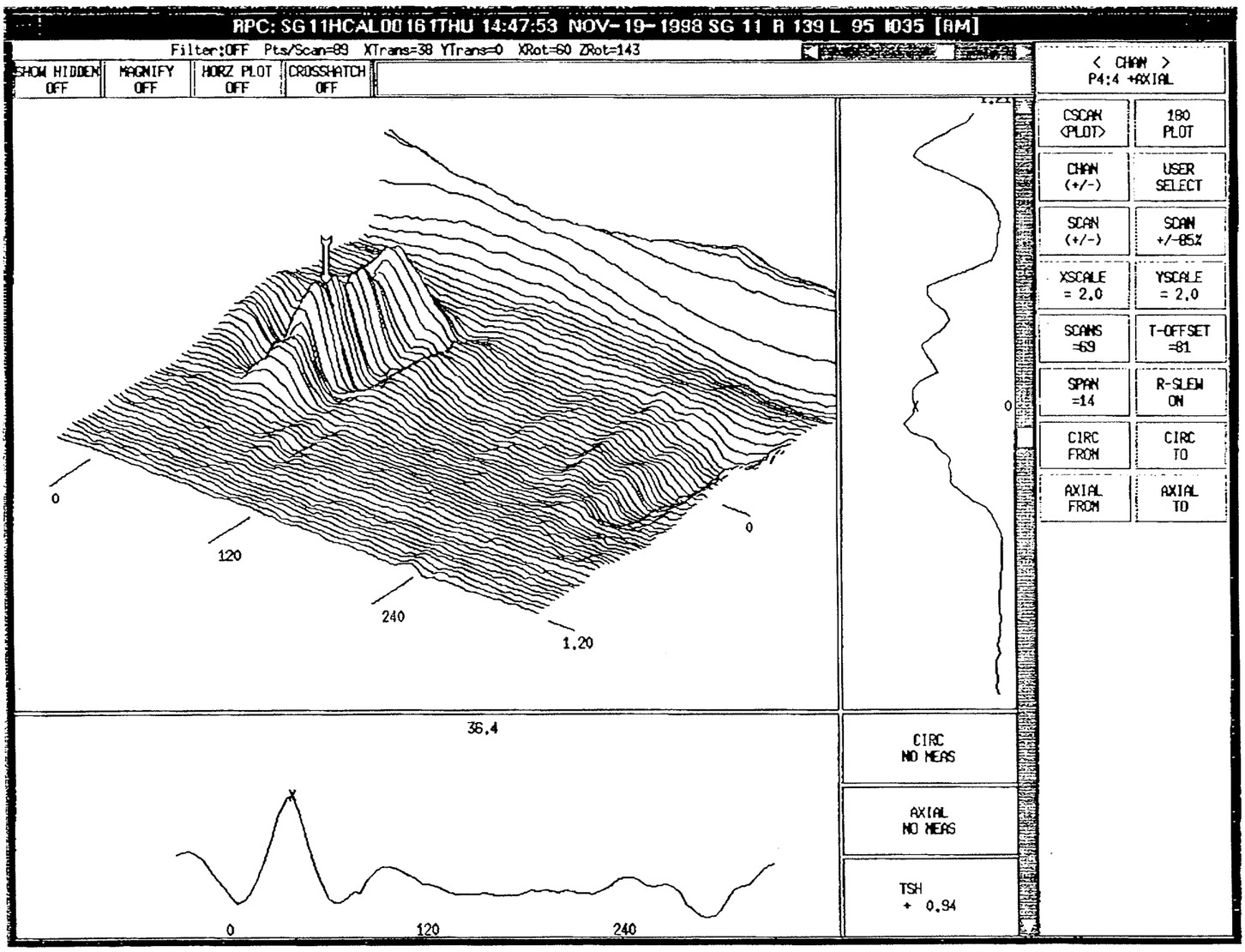
(4)


RPC: SG11HCAL00132THU 10:10:07 APR-27-2000 SG 11 R 139 L 95 I158 [M8]
Filter:OFF Pts/Scan=93 XTrans=-20 YTrans=0 XRot=60 ZRot=146
SHOW HIDDEN OFF
MAGNIFY OFF
HORZ PLOT OFF
CROSSHATCH OFF
240
0
1.48
0
216.8
120
240
0
CIRC NO MEAS
AXIAL NO MEAS
TSH + 0.99
< CHAN > P2:5 +Axial
CSCAN <PLOT>
180 PLOT
CHAN (+/-)
USER SELECT
SCAN (+/-)
SCAN +/-85%
XSCALE = 2.0
YSCALE = 2.0
SCANS =109
T-OFFSET =22
SPAN =28
R-SLEW ON
CIRC FROM
CIRC TO
AXIAL FROM
AXIAL TO
CIRC AVG OFF
AXIAL AVG OFF

A# 1


Eddynet98: Analysis [C]– 1989,90 M2691 as qir [RM]
File Analysis System Tools Layout Add Displays Help
Tube Comment:
MOO
SG11HCAL00161 THU 14:47:53 NOV-19-1998 SG 11 ROW 139 LIN 95 I035
< Lmrks >
Clear
P4 300 +AXIAL 9 20 +LOC
G1 C5 Vert G1 C5 Vert
P4:4 300 G1 C5 +AXIAL
0.19 v/d span 14 rot 223
1.21
TSH
-1.21
12972
Vpp MxR Vmx GAn 180
TSH + 0.94
chan
> <

AH 1


RPC: SG 11HCAL00 16 1THU 14:47:53 NOV-19-1998 SG 11 R 139 L 95 W035 [AM]
Filter:OFF Pts/Scan=89 XTrans=38 YTrans=0 XRot=60 ZRot=143
SHOW HIDDEN OFF
MAGNIFY OFF
HORZ PLOT OFF
CROSSHATCH OFF
0
120
240
1.20
0
0
36.4
0
120
240
CIRC NO MEAS
AXIAL NO MEAS
TSH + 0.94
< CHAN > P4:4 +AXIAL
CSCAN <PLOT>
180 PLOT
CHAN (+/-)
USER SELECT
SCAN (+/-)
SCAN +/-85%
XSCALE = 2.0
YSCALE = 2.0
SCANS =69
T-OFFSET =81
SPAN =14
R-SLEW ON
CIRC FROM
CIRC TO
AXIAL FROM
AXIAL TO

AH 1

(7)

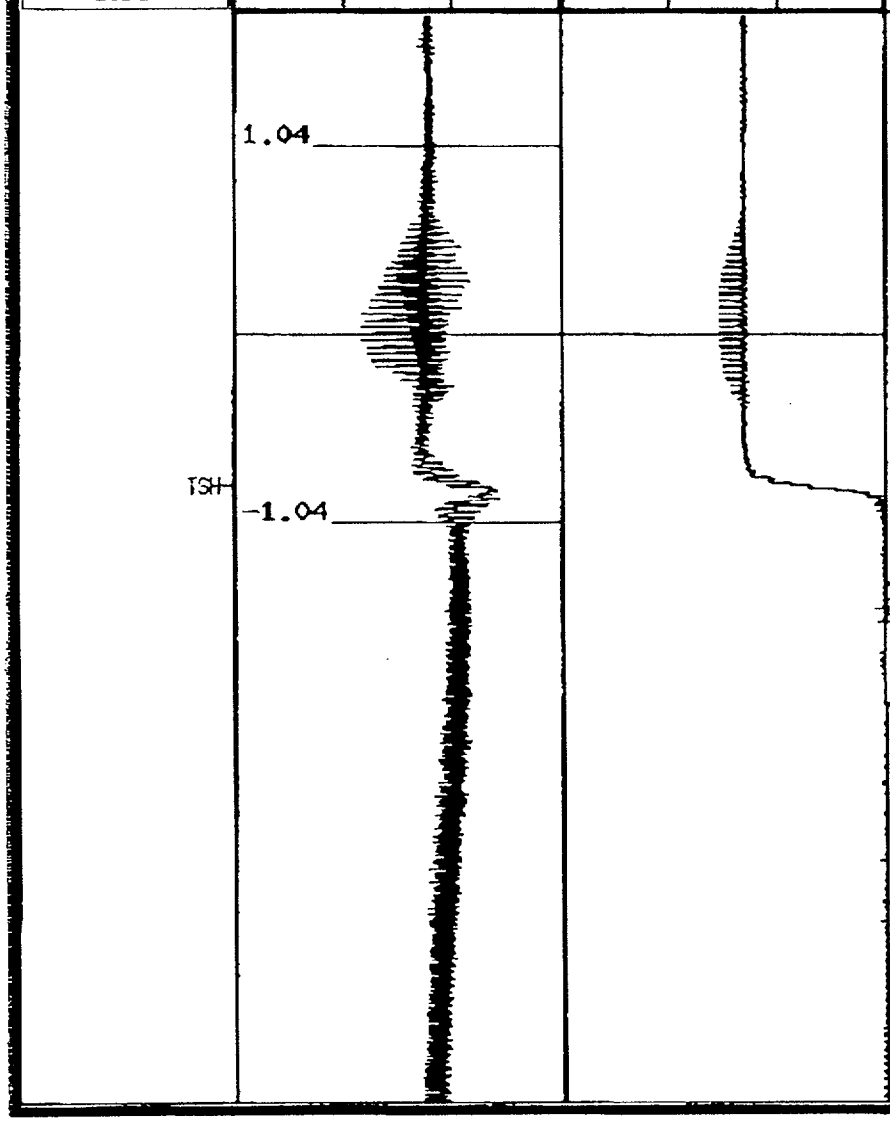
Eddynet98: Analysis [C]-1989,90 R37 16 as resolution [INT]

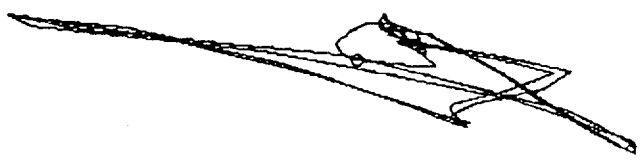
File Analysis System Tools Layout Add Displays Help

Tube Comment: MOD

SG11HCAL00110 SAT 22:28:51 APR-26-1997 SG 11 ROW 139 COL 95 I015

< Lmrks >	4	300	+AXI	10	20	.115	4:	300	G1	C5	+AXI
Clear	G1	C5	Vert	G1	C1	Vert	0.21 v/d		span 30		rot 225



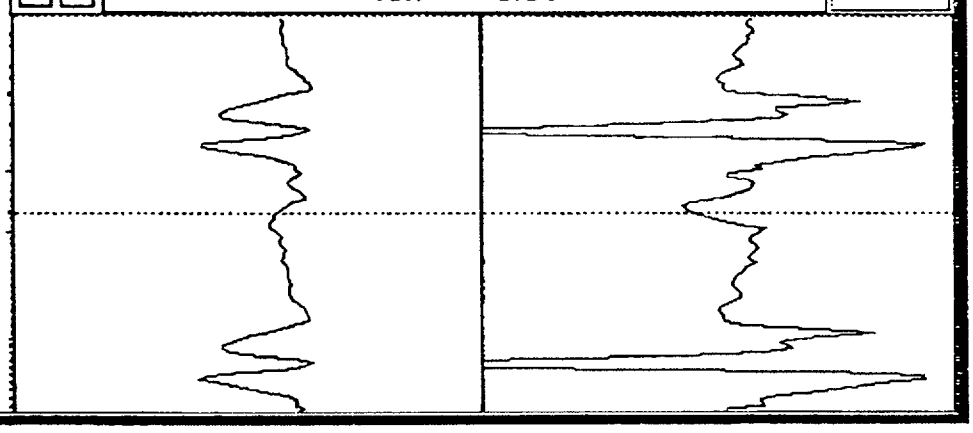


8721

Vpp MxR Vmx GAn 180

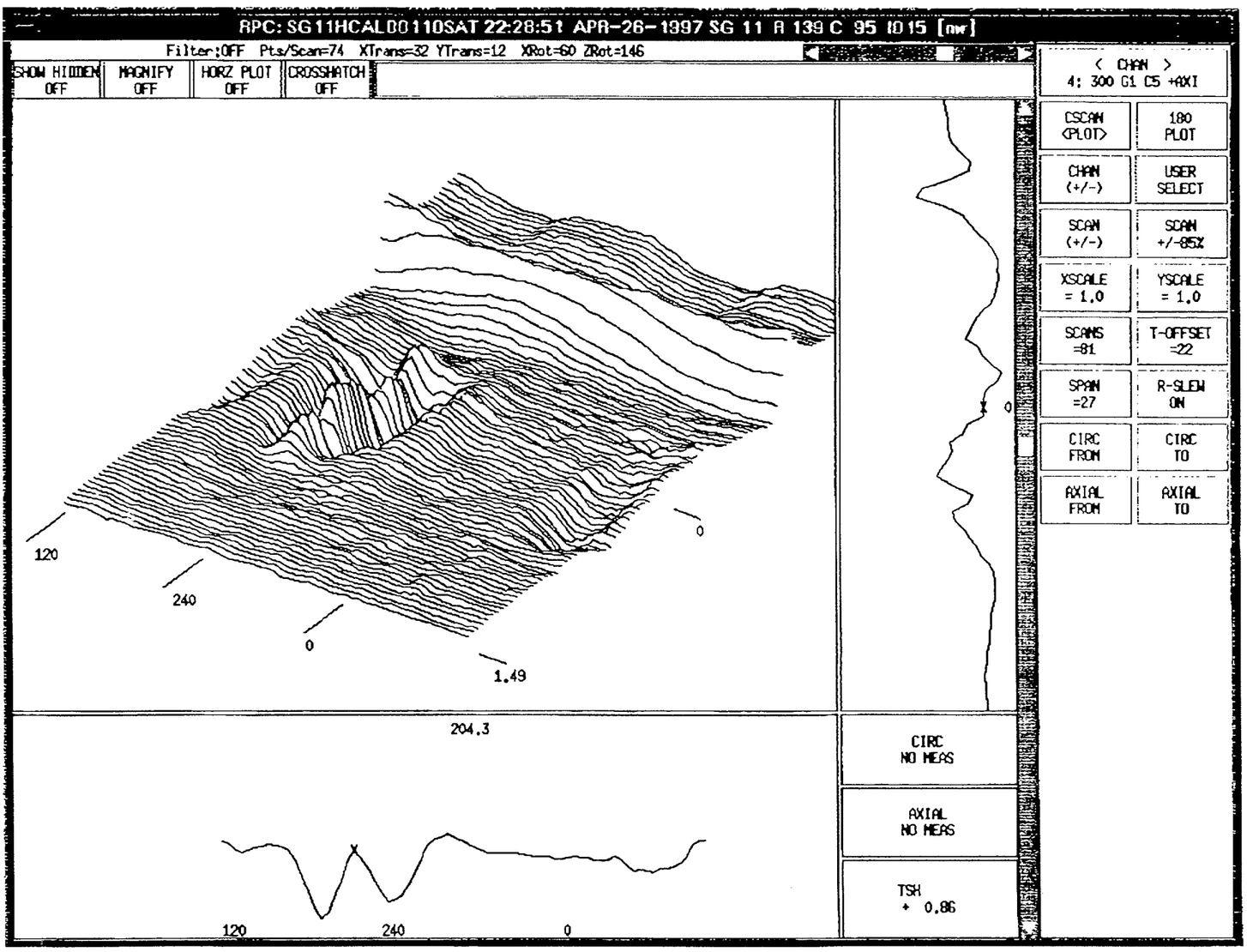
chan > <

TSH + 0.84



A # 1

(8)


RPC: SG11HCALD0110SAT 22:28:51 APR-26-1997 SG 11 A 139 C 95 I015 [nwr]
Filter:OFF Pts/Scan=74 XTrans=32 YTrans=12 XRot=60 ZRot=146
SHOW HIDDEN OFF
MAGNIFY OFF
HORZ PLOT OFF
CROSSHATCH OFF
120
240
0
1.49
0
204.3
120
240
0
CIRC NO MEAS
AXIAL NO MEAS
TSH + 0.86
< CHAN > 4: 300 G1 C5 +AXI
CSCAN <PLOT>
180 PLOT
CHAN (+/-)
USER SELECT
SCAN (+/-)
SCAN +/-85%
XSCALE = 1.0
YSCALE = 1.0
SCANS =81
T-OFFSET =22
SPAN =27
R-SLEW ON
CIRC FROM
CIRC TO
AXIAL FROM
AXIAL TO

A # 1

(9)

Eddynet98: Analysis [C]-1989,90 M2691 as qir [MB]

File Analysis System Tools Layout Add Displays Help

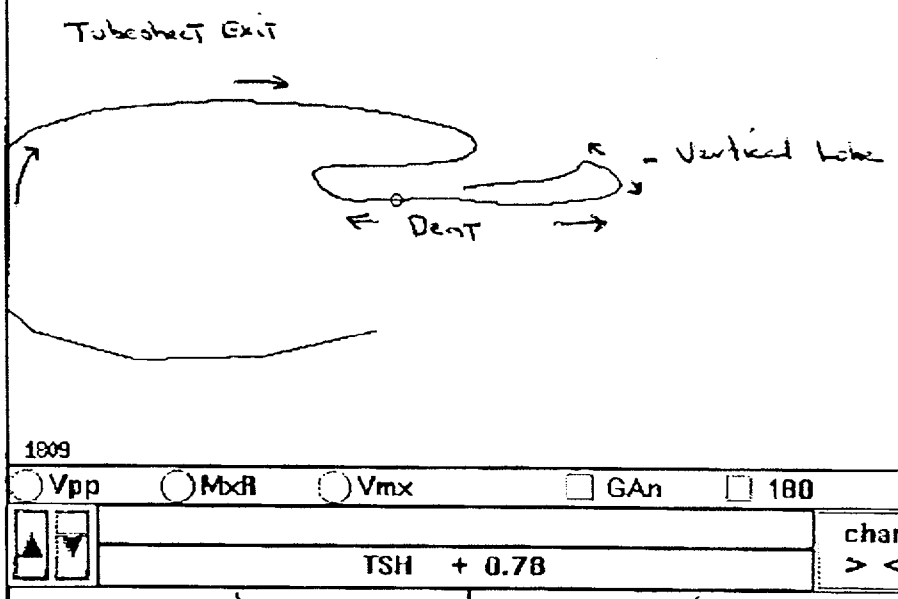
Tube Comment: :Pull NOD

SG10CCAL00029 SUN 8:56:35 DEC-02-2001 SG 10 ROW 139 LIN 95 1071

< Lmrks >	P1	400	Diff	4	100	Absl	3:	100	G1	C1	Diff
Clear	G1	C1	Vert	G1	C5	Vert	1.67 v/d		span 61		rot 256

TEC TSC 01C 02C 03C 04C 05C 06C 07C 08C 09C DCB DCT VS5 VS3 VS1 DHT DHB 09H 08H 07H 06H 05H 04H 03H 02H 01H TSH TEH

1.49



Vpp MxR Vmx GAn 180

chan > <

TSH + 0.78

A # 1

(10)

Eddynet98: Analysis [C]-1989,90 M2691 as qir [MB]

File Analysis System Tools Layout Add Displays Help

Tube Comment: :Pull H00

SG10CCAL00029 SUN 8:57:32 DEC-02-2001 SG 10 ROW 138 LIN 96 1072

< Lmrks >	P1	400	Diff	4	100	Absl	3:	100	G1	C1	Diff
Clear	G1	C1	Vert	G1	C5	Vert	1.67 v/d		span 61		rot 256

TEC
TSC
01C
02C
03C
04C
05C
06C
07C
08C
09C
DCB
DCT
VS5
VS3
VS1
DHT
DHB
09H
08H
07H
06H
05H
04H
03H
02H
01H
TSH
TEH

1.49

Normal Tubesheet Exit
Adjacent Tube -

1838

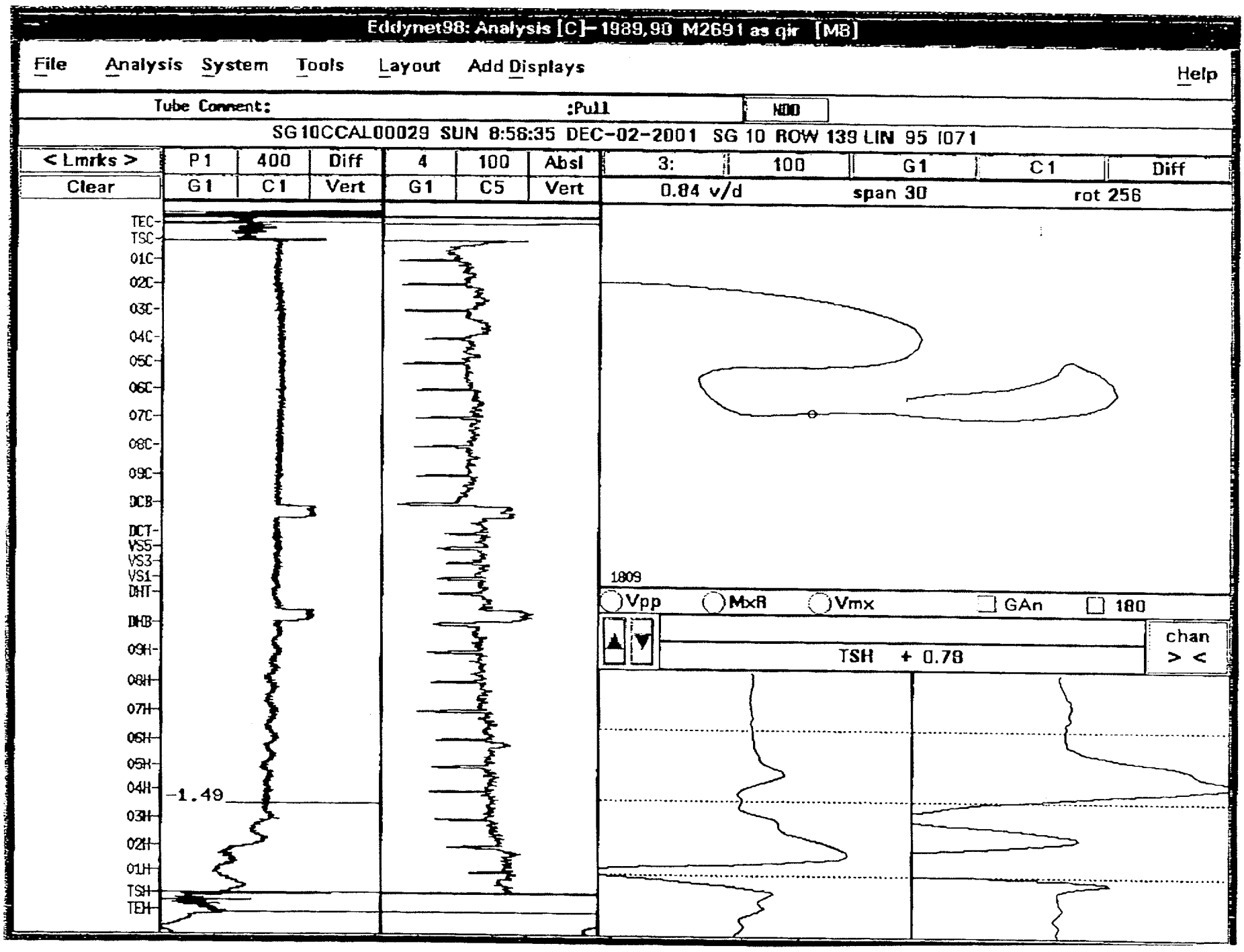
Vpp MxR Vmx GAn 180

TSH + 0.78

chan > <

A H 1

(11)


Eddynet98: Analysis [C]- 1989,90 M2691 as qir [MB]
File Analysis System Tools Layout Add Displays Help
Tube Comment: :Pull NDD
SG10CCAL00029 SUN 8:56:35 DEC-02-2001 SG 10 ROW 139 LIN 95 1071
< Lmrks > P1 400 Diff 4 100 Absl 3: 100 G1 C1 Diff
Clear G1 C1 Vert G1 C5 Vert 0.84 v/d span 30 rot 256
TEC
TSC
01C
02C
03C
04C
05C
06C
07C
08C
09C
DCB
DCT
VS5
VS3
VS1
DHT
DHB
09H
08H
07H
06H
05H
04H
03H
02H
01H
TSH
TEH
-1.49
1809
Vpp MxR Vmx GAn 180
TSH + 0.78
chan
> <

A # 1

(12)

Eddynet98: Analysis [C]- 1989,90 M2691 as qir [RM]

File Analysis System Tools Layout Add Displays Help

Tube Comment: MOD

SG10CCAL00020 SUN 11:46:28 APR-23-2000 SG 10 ROW 139 LIN 95 I034

< Lmrks >	P1	400	Diff	4	100	Absl	3:	100	G1	C1	Diff
Clear	G1	C1	Vert	G1	C5	Vert	0.86 v/d		span 30		rot 254

TEC
TSC
01C
02C
03C
04C
05C
06C
07C
08C
09C
DCB
DCT
VS5
VS3
VS1
DHT
DHB
09H
08H
07H
06H
05H
04H
03H
02H
01H
TSH
TEH
0.00
0.00

1790
1780

Vpp MxR Vmx GAn 180

TSH + 0.78

chan > <

A # 1

(13)

Eddynet98: Analysis [C]—1989,90 M2691 as qir [M8]

File Analysis System Tools Layout Add Displays Help

Tube Comment: NDD

SG10CCAL00036 SUN 18:35:13 NOV-15-1998 SG 10 ROW 138 LIN 95 1017

<Lmrks>	P1	400	Diff	4	100	Absl	3:	100	G1	C1	Diff
Clear	G1	C1	Vert	G1	C5	Vert	1.67 v/d		span 65		rot 258

02H

01H

TSH

TEH

1776

Vpp MxR Vmx GAn 180

TSH + 1.01

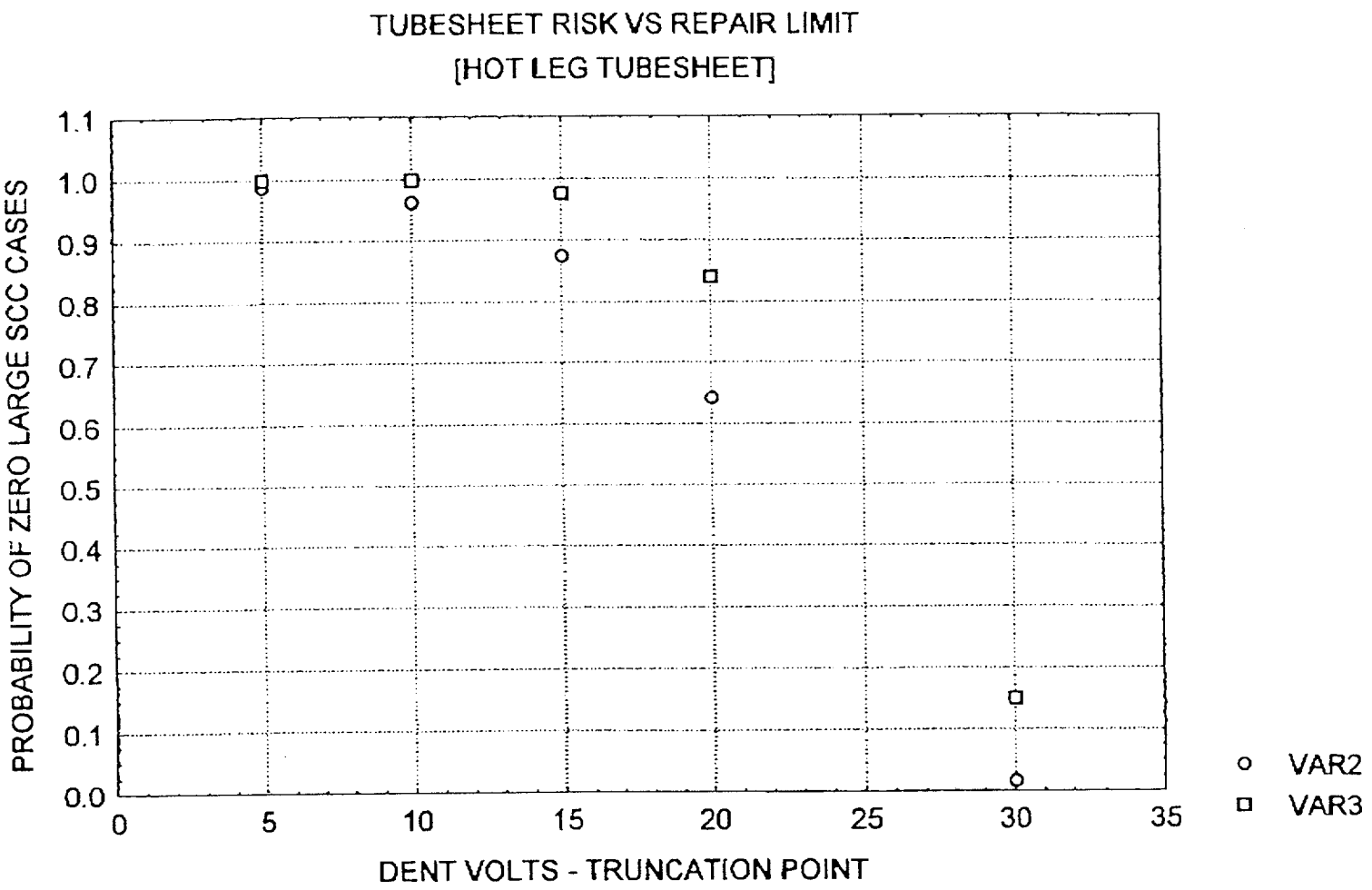
chan > <

ATTACHMENT 2

4 PAGES

HOTLEG TUBESHEET RISK MODEL

- BASED ON SG-A DATA [4 SCC INDICATIONS]
- HIGHEST RISK
- LOGISTIC REGRESSION MODEL
  - CONDITIONAL PROBABILITY OF SCC GIVEN DENT VOLTAGE
  - APPLIED TO INDIVIDUAL TUBES
  - COMBINED OVER VOLTAGE SPECTRUM
- RISK VS REPAIR LIMIT FOR TUBESHEET AREA


TUBESHEET RISK VS REPAIR LIMIT
[HOT LEG TUBESHEET]
PROBABILITY OF ZERO LARGE SCC CASES
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
5
10
15
20
25
30
35
DENT VOLTS - TRUNCATION POINT
VAR2
VAR3

ATTACHMENT 3

3 PAGES

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

December 10, 2001

The following discussion points have been prepared to facilitate the phone conference arranged with the St. Lucie licensee to discuss the results of the steam generator (SG) tube inspections to be conducted during the upcoming St. Lucie Plant, Unit 2 refueling outage. This phone call is scheduled to occur towards the end of the planned SG tube inspection interval, but before the unit exits its refueling outage.

It is the staff's expectation that any significant results or relevant trends discussed during the phone conference, as well as any materials provided by your staff to assist us during the phone conference in the understanding of the SG tube results, will be included in one of the special reports required by the plant Technical Specifications.

1. For each steam generator, provide a general description of areas examined, including the expansion criteria utilized and type of probe used in each area.

Response:

	Examination Scope	% Complete @ 0400
Bobbin Probe	*100% Full Length*	*100%*
Plus Point Probe	*100% Hot Leg Tubesheet*	*100%*
	30% Row 1&2 U-bends	*100%*
	30% Hot Leg Dents	*100%*

Remaining Items:

- *Diagnostic testing*
- *In Situ Pressure Testing*
- *Tube plugging*

Update on two issues:

- *Axial indications at dents are OD based on additional review of data (i.e., 100 kHz)*
- *Axial indications at dents were present in prior inspection but at lower level*

2. For analyzed eddy current results, describe bobbin indications (those not examined with rotating pancake coil (RPC) and RPC/Plus Point/Cecco indications. Include the following information in the discussion: location, number, degradation mode, disposition, and voltages/depths/lengths of significant indications.

Plus Point rotating probe indications are summarized in the following table. All corrosion-type indications will be plugged, and circumferential indications will be stabilized.

Type	*Mode*	*Location*	*No.*	*Voltages*	*Depths*	*Lengths*
Axial	*OD*	*Eggcrate*	*257*	*0.14 - 0.60*	*24-60%*	*0.16-1.94"*
Axial	*OD*	*Sludge Pile*	*24*	*0.09 – 0.55*	*24-75%*	*0.13 – 0.30"*
Axial	*OD*	*Dents*	*6*	*1.43 - 3.35*(1)	*44-99%*	*0.20 – 0.43"*
Axial	*ID*	*Tubesheet*	*2*	*0.32 – 0.38*	*58-82%*	*0.16 – 0.20"*
Circ	*OD*	*Tubesheet*	*12*	*0.12 – 0.42*	*19-94%*	*25-123 Degrees*
Vol	*OD*	*Eggcrate / TS*	*1/1*	*0.23 – 0.27*	*47-85%*	*0.20 - 0.45"*

(1) Indication depth and voltage estimates influenced by a dent.

St. Lucie Unit 2 Steam Generator Dent Inspection Results		
Plus Point Inspection of Dents	**Dents Defective**	**Location**
All Hot Leg Dents Top of Tubesheet to 1st Support	4 OD Axial	3 at TSH + ~1" , 1 at TSH+24" 22 – 44 Volts
All Hot Leg Dents 1st Eggcrate to Hot Leg Bend 5 > Volts	0	1st Eggcrate to Hot Leg Bend
Review All Dents 1st Tube Support to Hot Bend < 5 Volts	1 OD Axial	Plus Point Inspection of Distorted Dent Indications and all dents at Eggcrates
All Dents Row 1-18 U-Bends	1 OD Axial	Row 13 U-Bend 6.1 Volts
Majority of Cold Leg Dents at Top of Tubesheet	0	

Preventatively plug all dents >10 Volts below 1st tube support on Hot Leg

PRELIMARY IN SITU TEST CANDIDATE LIST						
S/G	Row	Line	Location	FLAW TYPE	TEST REASON	RESULT
A	139	95	TSH+0.82	ASI-OD / Dent	Burst <3NODP / Leak TBD / Voltage	Passed
A	140	80	TSH+0.86	ASI-OD / Dent	Burst <3NODP / Leak TBD / Voltage / Depth	Full Tube Required
A	20	2	TSH+0.83	ASI-OD / Dent	Burst <3NODP / Leak 0.040 gpm / Voltage / Depth	Full Tube Required
A	39	103	TSH-1.82	ASI-ID	Burst <3NODP / Leak 0.032 gpm / Multiple	Passed
"	"	"	TSH-2.05	ASI-ID	Burst <3NODP / Leak 0.011 gpm / Multiple	Passed
A	70	76	TSH+0.56	ASI-OD	Burst <3NODP / Leak	Passed
A	49	57	TSH+0.23	ASI-OD	Depth	Passed
A	55	113	TSH+24.6	ASI-OD / Dent	Voltage	Full Tube Required
A	117	61	1H-0.22	ASI-OD	Burst <3NODP / Longest Length	Passed
A	8	144	3H+0.80	ASI-OD	Length	Passed
A	109	65	1H+0.16	ASI-OD	Length	Passed
B	41	115	TSH-0.03	CSI-OD	Length / Depth / Leak 0.184 gpm	
B	53	61	TSH-0.12	CSI-OD	Depth / Leak 0.029 gpm	
B	58	88	2H+0.19	ASI-OD	Burst <3NODP / Max Leakage	
B	64	108	1H-0.37	ASI-OD	Length	
B	47	51	1H-.025	ASI-OD	Length / Multiple Flaw	
"	"	"	1H+0.25	ASI-OD	Long Length / Multiple Flaw	
B	70	78	TSH+0.31	ASI-OD	Burst <3NODP / Depth	
B	64	108	1H-0.37	ASI-OD	Length	
B	83	111	TSH+0.20	VOL-OD	Depth	

NOTE: S/G 2B Test List is still preliminary