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Manager of
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U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Subject: **Docket No. 50-361**
Report Of Inservice Inspection Of Steam Generator Tubes,
Cycle 13 Additional Information
San Onofre Nuclear Generating Station, Unit 2

Reference: Letter from D. E. Nunn (SCE) to Document Control Desk dated March 17, 2004, Subject: Special Report: Inservice Inspection of Steam Generator Tubes, Cycle 13

Gentlemen:

By the referenced letter, Southern California Edison (SCE) submitted the reports required by Technical Specification 5.7.2.c of the inservice inspection of steam generator tubes at San Onofre Nuclear Generating Station Unit 2. Subsequently, NRC staff requested certain additional clarifying information. The requested information is provided in the enclosure.

SCE is making no new commitments in this submittal.

If you have any questions or would like additional information concerning this subject, please contact Mr. Jack Rainsberry at (949) 368-7420.

Sincerely,

Enclosure

cc: B. S. Mallett, Regional Administrator, NRC Region IV
B. M. Pham, NRC Project Manager, San Onofre Units 2, and 3
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 & 3

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The results of the 2004 San Onofre Unit 2 steam generator tube inspections were reported to the NRC in a letter dated March 17, 2004 (ML040850599).

In order for the staff to complete its review, the following information is requested:

1. **Please confirm that the planned inspection scope listed in Table 1 of the report was the actual scope.**

Southern California Edison (SCE) Response: The inspection scope in Table 1 was planned and completed.

2. **What inspections were performed to detect loose parts? Discuss any loose parts found, the source of the loose parts, the effect the parts had on any tubes, and whether the parts were removed. For any part not removed, please discuss the assessments performed to ensure the part would not adversely affect tube integrity.**

SCE Response:

Eddy current inspections specifically intended to detect loose parts are described in rows 1, 2, and 3 in Table 1 of SCE's March 17, 2004 letter. The row 3 first column description can be enhanced by adding the words, "including all inservice tubes on the periphery of the tube bundle and the blowdown lane." No loose parts were found during eddy current inspections.

Foreign Object Search and Retrieval (FOSAR) was performed on the secondary side of both steam generators. This remote visual inspection was performed at the top-of-tubesheet on the periphery of the tube bundle and the blowdown lane.

Additionally, direct visual inspections for objects used in conjunction with work in all areas of the steam generator are performed to the requirements of the site's Foreign Materials Exclusion Program.

FOSAR Results for Steam Generator E-088:

One metallic object was found and removed from Steam Generator E-088. Dimensions were approximately 2.5 inches by 3 inches with thickness at the middle being in the range of 1/16 inch to 1/8 inch, with edges apparently eroded thinner.

The object was evaluated for potential sources. The results of this evaluation were not conclusive. The object was verified to be small enough to fit through the feed ring discharge elbows. Accordingly, source evaluation was coordinated with both steam generator engineers and engineers that work with systems in the secondary side fluid flow path, upstream of the steam generator. Review of plant experience and the object provided insufficient evidence to correlate it to a component or a maintenance activity.

The object had no effect on the tubes. The eddy current inspections did not indicate evidence of tube degradation that corresponded to this object. Further, the object was not readily movable in its location between the blowdown ring and the cold leg top of the tubesheet, and was not touching any tubes.

This part found in the FOSAR was removed.

FOSAR Results for Steam Generator E-089:

Four small pieces of tape were found and removed. Their source was determined to be work this outage in the upper portion of the steam generator. This finding was reported and dispositioned in the site corrective action process. This provided Foreign Material Exclusion Program feedback and trending. There was no effect on tubes because these pieces were flexible tape and were removed in a timely manner.

These parts found in the FOSAR were removed.

Foreign Object in Steam Generator E-089 during plant heatup:

Elevated chloride levels were noted by routine chemistry monitoring during plant heatup and suggested a foreign object in the secondary-side of Steam Generator E-089. The chloride concentration peak was approximately 1 part per million (ppm). The chloride level was reduced using the normal chemical contaminant cleanup procedures and available industry guidance from the Electric Power Research Institute (EPRI).

Prior to returning the unit to service, the plant returned to Mode 5 for another reason. On this occasion the secondary side of the steam generator was re-opened and inspected for possible foreign objects. The apparent source was an approximately 25 foot long section of "elephant trunk" flexible hose. Hose of this type is comprised of a wire spring, and is covered with a polyvinyl chloride covering. The apparent source was consistent with the chloride concentration experience. The hose had been used as a

foreign materials barrier during the outage work, and was not removed upon work completion. Items used during steam generator maintenance are controlled by the site Foreign Material Exclusion Program. This event was dispositioned under the site corrective action program.

The residue of the hose was removed from the steam generator.

3. **During conference calls with the staff in March 2004 (ML040910379), the licensee described how the number and depth of indications varied with distance below the top of the tubesheet. For each steam generator, as a function of distance below the top of the tubesheet, please provide the number of indications of each type (i.e. axial/circumferential, outside diameter/inside diameter) and an estimate of the size (length, depth). Please use several depth intervals, including 5" and 17" below the TTS as two of the boundaries between depth intervals, since these were the lower limits of the rotating probe inspections in 2002 and 2004, respectively.**

SCE Response: Appendices 1 through 4 provide the requested information in the requested format. The vast majority of this information was previously provided in Appendices 3 and 4 of SCE's March 17, 2004 letter.

Appendices 1 and 3 are an extraction and re-arrangement of that information, with the addition of some size measurements. Appendices 2 and 4 are graphic aids for Appendices 1 and 3 respectively.

The size measurements that are provided are those that may have relevance, consistent with EPRI guidance. EPRI provides guidance on indication voltage thresholds for which sizing measurements are relevant for tubing integrity purposes. This guidance is in EPRI's "Steam Generator In Situ Pressure Test Guidelines, Revision 2", Report Number 1007904, dated August 2003.

4. **At the time of the March 17, 2004, conference call with the staff (ML040910379) regarding reduced sleeve diameters, the licensee was investigating whether a technique can be qualified for detecting defects behind the nickel and microlok bands. The licensee was also investigating the need to revise the topical report to address inspection of the region where the lower joint would be established and to address the implications**

of having flaws behind the nickel and microlok bands. Please provide a status update on these investigations.

SCE Response:

The issue of tube inspectability behind the metal bands of installed sleeves was raised during the discussion of the reduced sleeve diameters at San Onofre. Westinghouse assessed current ECT technique capabilities in a calibration standard with axial notches in the parent tubing behind the sleeve's nickel and microlok bands. These notches were 50%, 70% and 100% throughwall. The three notches behind the microlok band and the 100% notch behind the nickel band were identified during the analysis of the calibration standard data using current ECT techniques.

Westinghouse developed a draft position paper regarding the structural integrity of the rolled joint utilizing this information This discusses the efficacy of a less rigorous inspection regime behind the bands. This was discussed with the NRC Staff in a telephone conference call on August 3, 2004. Westinghouse provided technical discussion during the call, and SCE, as an interested utility, was a listening participant. Review of this draft position paper is ongoing. Test programs are being developed in the case that review indicates further needs.

Westinghouse is developing a test program to increase understanding of the rolled joint strength and leakage characteristics. This program would include the testing of reduced length rolled joints to determine their structural capability. These tests would take no credit for the nickel band area of the joint.

Additionally, Westinghouse is developing a test program that would include critical sized notches behind the two bands and determine detectability of these notches. The program would utilize a Ghent-style ECT probe. The results of this program, if successful in detecting flaws, would be issued as an addendum to the ECT technique qualification report.

It is not expected that resolution of inspection at the nickel band will require a revision to the currently approved sleeving topical report (CEN-633-P, Rev. 02).

5. **Please discuss the results of the rotating probe examinations of dents and scallop bar support regions. Describe any degradation found in these exams and identify those flaws that were also detected with bobbin probes.**

SCE Response:

Scallop Bar Support Regions: The results of this rotating probe examination were that no indications were found.

Dents: Steam Generator E-089 results of this rotating probe examination were that no indications were found. Steam Generator E-088 results of this rotating probe examination (including bobbin probe detection correlation) are provided in Table 1. All rotating probe indications originated from the inside diameter of the tubing, and were classified as Single Axial Indications (SAI). Two indications in tube number Row 54 Column 94 were in the same vicinity, and thus conservatively considered during sizing and integrity evaluation to be one composite indication. Bobbin probe examination results for the larger dents are shown in Table 1 as "not applicable (NA)", because of the interfering geometry variable limitations of that technique.

Table 1
Results of the Rotating Probe Examinations of Dents, and Associated Bobbin Probe Results in Steam Generator E-088

Indication Location				Rotating Probe			Bobbin Probe	
Tube Row	Tube Column	Tube Support and Inches from its Center		Volts	Depth (%)	Length (inches)	Detection of Indication (Volts)	Dent (Volts)
14	56	05H	+0.71	1.02	39	0.18	1.14	3.05
22	114	06H	+0.61	1.22	37	0.17	NA	24.64
29	113	04H	+0.01	0.67	30	0.34	NA	10.81
54	94	06H	+0.50	0.70	47	0.43	NA	5.65
54	94	06H	+0.69	0.83				
76	62	08H	-0.02	0.46	NA	NA	0.42	3.92

Appendix 1 - San Onofre Unit 2

Steam Generator E-088

Axial and Circumferential Indications At or Below The Top-of-Tubesheet

Outage	SG	Row	Col	Ind	Elevation		Volts	Degrees	Location Relative To Top-of-Tubesheet	Depth (%)	Circ Length (degrees)	Axial Length (inches)	OD? Yes or Blank if No
2004	SG88	48	56	SAI	TSH	0.00	0.24	104	0.00				Yes
2004	SG88	56	72	SCI	TSH	0.00	0.13	114	0.00				Yes
2004	SG88	60	116	MCI	TSH	0.00	0.47	29	0.00				
2004	SG88	80	86	SCI	TSH	-0.02	0.49	22	-0.02				
2004	SG88	20	62	SCI	TSH	-0.02	0.19	57	-0.02				Yes
2004	SG88	69	101	SCI	TSH	-0.02	0.37	22	-0.02				
2004	SG88	25	41	MCI	TSH	-0.03	0.19	121	-0.03				Yes
2004	SG88	35	149	SCI	TSH	-0.03	0.29	122	-0.03				Yes
2004	SG88	70	108	SCI	TSH	-0.04	0.64	27	-0.04	69	20		
2004	SG88	78	80	SCI	TSH	-0.06	0.63	26	-0.06	57	32		
2004	SG88	30	118	SCI	TSH	-0.07	0.46	15	-0.07				
2004	SG88	16	56	SCI	TSH	-0.07	0.25	24	-0.07				
2004	SG88	27	127	SCI	TSH	-0.07	0.54	66	-0.07	67	27		Yes
2004	SG88	82	114	SCI	TSH	-0.08	0.56	19	-0.08	47	27		
2004	SG88	67	103	SCI	TSH	-0.08	0.21	23	-0.08				
2004	SG88	91	97	SCI	TSH	-0.08	0.69	23	-0.08	57	27		
2004	SG88	82	104	SCI	TSH	-0.09	0.33	36	-0.09				
2004	SG88	42	112	SAI	TSH	-0.09	0.57	13	-0.09	35		0.11	
2004	SG88	57	119	MCI	TSH	-0.09	0.43	23	-0.09				
2004	SG88	89	99	MCI	TSH	-0.10	0.70	23	-0.10	61	51		
2004	SG88	80	104	SCI	TSH	-0.10	0.28	20	-0.10				
2004	SG88	23	35	SCI	TSH	-0.11	0.58	24	-0.11	38	32		
2004	SG88	99	75	SCI	TSH	-0.11	0.76	24	-0.11	58	32		
2004	SG88	46	114	SCI	TSH	-0.11	0.46	18	-0.11				
2004	SG88	83	63	SCI	TSH	-0.12	0.49	22	-0.12				
2004	SG88	50	112	SCI	TSH	-0.13	0.26	17	-0.13				
2004	SG88	13	119	SCI	TSH	-0.13	0.33	22	-0.13				
2004	SG88	38	36	SCI	TSH	-0.13	0.39	21	-0.13				
2004	SG88	13	121	SCI	TSH	-0.13	0.33	21	-0.13				
2004	SG88	60	126	MCI	TSH	-0.13	0.40	20	-0.13				
2004	SG88	43	113	SCI	TSH	-0.13	0.47	33	-0.13				
2004	SG88	78	68	SCI	TSH	-0.14	0.42	18	-0.14				
2004	SG88	23	57	SCI	TSH	-0.14	0.44	30	-0.14				
2004	SG88	67	57	MCI	TSH	-0.15	0.51	21	-0.15	49	77		
2004	SG88	18	138	SCI	TSH	-0.15	0.26	27	-0.15				
2004	SG88	4	164	SAI	TSH	-0.16	0.77	20	-0.16	61		0.23	
2004	SG88	83	59	SCI	TSH	-0.17	0.24	16	-0.17				
2004	SG88	39	131	SCI	TSH	-0.21	0.25	20	-0.21				
2004	SG88	85	95	SCI	TSH	-0.23	0.36	23	-0.23				
2004	SG88	32	54	SCI	TSH	-0.32	0.77	27	-0.32	63	24		
2004	SG88	65	115	MCI	SBH	-0.35	1.36	34	-11.60	92	313		
2004	SG88	60	92	SAI	TSH	-0.38	0.41	20	-0.38				
2004	SG88	65	113	MCI	SBH	-0.54	0.95	31	-11.79	84	120		
2004	SG88	53	77	SAI	TSH	-0.57	0.28	11	-0.57				
2004	SG88	34	122	SCI	SBH	-0.72	0.26	20	-11.97				
2004	SG88	11	63	SAI	TSH	-0.85	0.35	17	-0.85				
2004	SG88	53	95	MAI	TSH	-0.88	0.94	15	-0.88	46		0.55	
2004	SG88	65	113	SCI	SBH	-0.96	0.39	24	-12.21				
2004	SG88	18	62	SAI	TSH	-0.99	0.27	15	-0.99				
2004	SG88	44	42	SAI	TSH	-1.13	0.50	13	-1.13				

Appendix 1 - San Onofre Unit 2

Steam Generator E-088

Axial and Circumferential Indications At or Below The Top-of-Tubesheet

Outage	SG	Row	Col	Ind	Elevation		Volts	Degrees	Location Relative To Top-of-Tubesheet	Depth (%)	Circ Length (degrees)	Axial Length (inches)	OD? Yes or Blank if No
2004	SG88	18	62	SAI	TSH	-1.14	0.45	17	-1.14				
2004	SG88	30	108	SAI	TSH	-1.17	0.54	14	-1.17	37		0.18	
2004	SG88	49	103	SAI	TSH	-1.21	0.45	17	-1.21				
2004	SG88	64	56	SAI	TSH	-1.22	0.34	14	-1.22				
2004	SG88	63	91	SAI	TSH	-1.22	0.43	16	-1.22				
2004	SG88	53	79	SAI	TSH	-1.24	0.38	14	-1.24				
2004	SG88	47	105	SAI	TSH	-1.29	0.55	14	-1.29	34		0.25	
2004	SG88	43	67	SAI	TSH	-1.32	0.46	15	-1.32				
2004	SG88	51	101	SAI	TSH	-1.36	0.52	22	-1.36	64		0.21	
2004	SG88	18	60	SAI	TSH	-1.47	0.56	14	-1.47	39		0.16	
2004	SG88	47	69	SAI	TSH	-1.62	0.33	17	-1.62				
2004	SG88	52	114	SAI	TSH	-1.67	0.49	15	-1.67				
2004	SG88	28	118	SAI	TSH	-1.78	0.45	13	-1.78				
2004	SG88	18	62	SAI	TSH	-1.80	0.49	7	-1.80				
2004	SG88	63	81	SAI	TSH	-1.86	0.30	18	-1.86				
2004	SG88	51	105	SCI	SBH	-1.87	0.33	21	-13.12				
2004	SG88	51	101	SAI	TSH	-1.92	0.40	18	-1.92				
2004	SG88	52	114	SAI	TSH	-1.92	0.52	15	-1.92	43		0.17	
2004	SG88	27	55	SCI	TSH	-2.00	0.38	17	-2.00				
2004	SG88	12	144	SAI	TSH	-2.03	0.51	16	-2.03	46		0.19	
2004	SG88	22	120	SAI	TSH	-2.06	0.53	16	-2.06	46		0.13	
2004	SG88	18	54	SCI	TSH	-2.06	0.34	25	-2.06				
2004	SG88	51	101	SAI	TSH	-2.25	0.57	17	-2.25	50		0.14	
2004	SG88	51	101	SAI	TSH	-2.60	0.33	25	-2.60				
2004	SG88	42	122	SAI	TSH	-2.60	0.51	13	-2.60	42		0.13	
2004	SG88	43	63	SAI	TSH	-2.93	0.65	18	-2.93	47		0.17	
2004	SG88	43	113	SAI	TSH	-2.97	0.81	16	-2.97	46		0.15	
2004	SG88	65	115	SCI	SBH	-3.22	0.27	15	-14.47				
2004	SG88	47	65	SAI	TSH	-3.36	0.58	10	-3.36	31		0.29	
2004	SG88	7	121	MCI	TSH	-3.47	0.37	23	-3.47				
2004	SG88	30	56	SCI	TSH	-3.61	0.46	17	-3.61				
2004	SG88	19	123	SCI	TSH	-3.68	0.37	18	-3.68				
2004	SG88	47	127	SCI	TSH	-3.73	0.48	21	-3.73				
2004	SG88	64	66	SAI	TSH	-3.84	0.69	13	-3.84	38		0.33	
2004	SG88	43	65	SAI	TSH	-3.85	0.66	16	-3.85	49		0.13	
2004	SG88	59	87	SAI	TSH	-3.86	0.37	14	-3.86				
2004	SG88	43	65	SAI	TSH	-3.99	0.60	14	-3.99	54		0.13	
2004	SG88	57	55	SCI	TSH	-4.06	0.33	29	-4.06				
2004	SG88	47	65	SAI	TSH	-4.27	0.55	10	-4.27	26		0.88	
2004	SG88	11	35	SAI	TSH	-4.34	0.45	21	-4.34				
2004	SG88	34	124	SAI	TSH	-4.37	0.37	15	-4.37				
2004	SG88	42	104	SAI	TSH	-4.45	0.54	23	-4.45	58		0.24	
2004	SG88	26	140	SCI	TSH	-5.12	0.51	29	-5.12	74	36		
2004	SG88	7	139	SCI	TSH	-5.48	0.35	17	-5.48				
2004	SG88	17	113	MCI	TSH	-5.53	0.43	21	-5.53				
2004	SG88	25	127	SCI	TSH	-6.20	0.60	21	-6.20	53	27		
2004	SG88	47	65	SAI	TSH	-6.30	0.48	12	-6.30				
2004	SG88	25	39	SAI	TSH	-6.56	0.37	11	-6.56				
2004	SG88	34	124	SAI	TSH	-6.65	0.48	11	-6.65				
2004	SG88	49	73	SAI	TSH	-6.77	0.49	18	-6.77				

Appendix 1 - San Onofre Unit 2

Steam Generator E-088

Axial and Circumferential Indications At or Below The Top-of-Tubesheet

Outage	SG	Row	Col	Ind	Elevation		Volts	Degrees	Location Relative To Top-of-Tubesheet	Depth (%)	Circ Length (degrees)	Axial Length (inches)	OD? Yes or Blank If No
2004	SG88	18	62	MCI	TSH	-6.78	0.41	26	-6.78				
2004	SG88	44	116	SAI	TSH	-6.83	0.89	20	-6.83	57		0.12	
2004	SG88	44	114	SCI	TSH	-7.05	0.46	21	-7.05				
2004	SG88	18	42	SCI	TSH	-7.18	1.95	32	-7.18	91	60		
2004	SG88	51	107	SAI	TSH	-7.21	0.83	17	-7.21	51		0.49	
2004	SG88	7	43	SAI	TSH	-7.23	0.59	22	-7.23	58		0.21	
2004	SG88	13	57	SCI	TSH	-7.23	0.44	21	-7.23				
2004	SG88	75	119	SAI	TSH	-7.24	0.59	12	-7.24	34		0.14	
2004	SG88	43	75	SAI	TSH	-7.25	0.39	15	-7.25				
2004	SG88	16	54	SCI	TSH	-7.49	0.28	22	-7.49				
2004	SG88	51	107	SAI	TSH	-7.52	0.42	12	-7.52				
2004	SG88	10	132	SCI	TSH	-7.68	0.82	33	-7.68	76	61		
2004	SG88	44	114	MCI	TSH	-7.82	2.34	32	-7.82	89	85		
2004	SG88	26	140	SCI	TSH	-7.93	0.80	30	-7.93	69	28		
2004	SG88	34	124	SAI	TSH	-8.07	0.56	18	-8.07	53		0.15	
2004	SG88	57	103	SAI	TSH	-8.31	0.37	13	-8.31				
2004	SG88	7	135	MCI	TSH	-8.60	5.73	39	-8.60	100	325		
2004	SG88	10	56	SCI	TSH	-8.84	1.06	26	-8.84	76	71		
2004	SG88	83	121	SCI	TSH	-9.02	0.46	16	-9.02				
2004	SG88	34	32	SCI	TSH	-9.20	1.06	26	-9.20	65	28		
2004	SG88	60	134	SCI	TSH	-9.25	0.72	23	-9.25	72	39		
2004	SG88	4	54	MCI	TSH	-9.35	2.50	33	-9.35	92	129		
2004	SG88	34	124	SAI	TSH	-9.47	0.52	19	-9.47	56		0.15	
2004	SG88	59	33	SAI	TSH	-9.50	2.67	29	-9.50	81		0.45	
2004	SG88	34	124	SAI	TSH	-9.68	0.44	17	-9.68				
2004	SG88	34	32	SCI	TSH	-9.76	0.75	22	-9.76	60	24		
2004	SG88	18	134	SCI	TSH	-9.76	2.18	40	-9.76	100	172		
2004	SG88	25	57	SCI	TSH	-9.83	0.24	15	-9.83				
2004	SG88	37	35	SCI	TSH	-9.83	0.37	20	-9.83				
2004	SG88	34	124	SAI	TSH	-9.83	0.38	14	-9.83				
2004	SG88	25	51	SCI	TSH	-9.88	2.02	38	-9.88	100	88		
2004	SG88	71	113	MCI	TSH	-10.09	0.45	32	-10.09				
2004	SG88	18	60	SCI	TSH	-10.13	0.57	24	-10.13	56	28		
2004	SG88	34	124	SAI	TSH	-10.18	0.46	14	-10.18				
2004	SG88	12	54	SCI	TSH	-10.18	4.53	51	-10.18	100	65		
2004	SG88	25	121	SCI	TSH	-10.25	0.68	30	-10.25	67	31		
2004	SG88	34	124	SAI	TSH	-10.42	1.05	22	-10.42	64		0.25	
2004	SG88	49	73	SAI	TSH	-10.42	0.35	18	-10.42				
2004	SG88	15	143	SCI	TSH	-10.48	4.95	38	-10.48	100	157		
2004	SG88	87	59	SCI	TSH	-10.53	0.92	29	-10.53	82	34		
2004	SG88	68	114	SCI	TSH	-10.55	0.33	19	-10.55				
2004	SG88	49	73	SAI	TSH	-10.63	1.51	25	-10.63	71		0.42	
2004	SG88	25	121	SCI	TSH	-10.70	0.80	27	-10.70	73	31		
2004	SG88	71	113	SCI	TSH	-10.72	0.38	26	-10.72				
2004	SG88	64	110	SAI	TSH	-10.76	0.50	16	-10.76				
2004	SG88	64	110	SAI	TSH	-10.93	0.44	18	-10.93				
2004	SG88	28	108	SAI	TSH	-11.22	2.66	29	-11.22	85		0.63	
2004	SG88	74	120	SCI	TSH	-11.24	0.50	17	-11.24				
2004	SG88	46	104	SCI	TSH	-11.39	0.26	19	-11.39				
2004	SG88	34	124	SCI	TSH	-11.40	0.30	25	-11.40				

Appendix 1 - San Onofre Unit 2

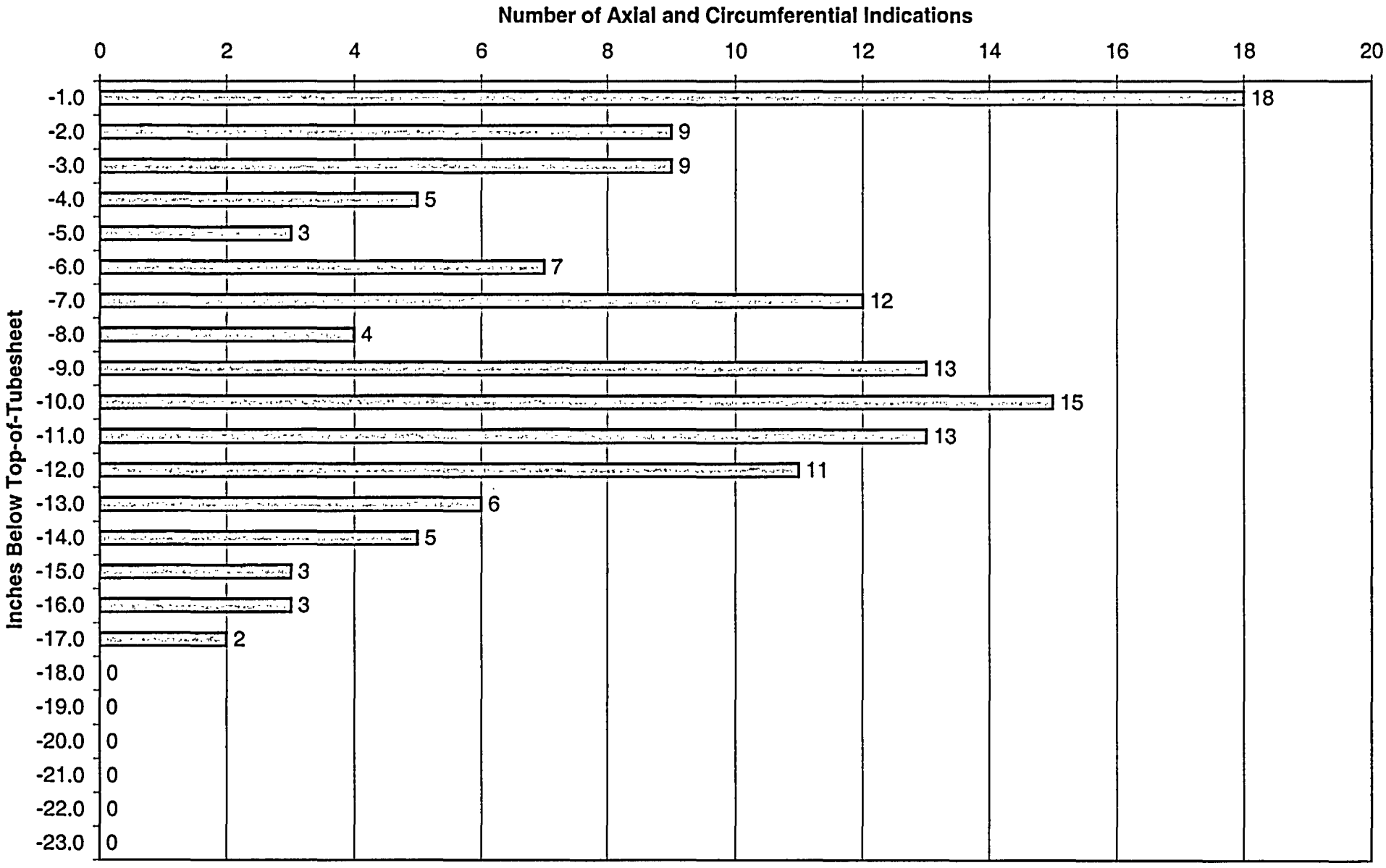
Steam Generator E-088

Axial and Circumferential Indications At or Below The Top-of-Tubesheet

Outage	SG	Row	Col	Ind	Elevation		Volts	Degrees	Location Relative To Top-of-Tubesheet	Depth (%)	Circ Length (degrees)	Axial Length (inches)	OD? Yes or Blank if No
2004	SG88	45	121	SCI	TSH	-11.48	0.32	22	-11.48				
2004	SG88	34	40	SCI	TSH	-11.64	0.59	20	-11.64	47	27		
2004	SG88	126	52	SCI	TSH	-11.69	0.79	15	-11.69	41	52		
2004	SG88	37	133	SCI	TSH	-11.87	5.55	38	-11.87	99	129		
2004	SG88	34	32	SCI	TSH	-11.92	0.85	22	-11.92	63	32		
2004	SG88	31	125	SCI	TSH	-11.92	0.98	29	-11.92	76	31		
2004	SG88	34	40	SCI	TSH	-12.06	0.64	22	-12.06	56	35		
2004	SG88	13	23	SAI	TSH	-12.09	0.95	16	-12.09	43		0.31	
2004	SG88	18	136	SCI	TSH	-12.11	3.38	37	-12.11	99	74		
2004	SG88	67	53	SCI	TSH	-12.20	0.45	21	-12.20				
2004	SG88	69	127	SAI	TSH	-12.49	1.13	20	-12.49	58		0.19	
2004	SG88	46	110	MCI	TSH	-12.49	0.69	31	-12.49	64	160		
2004	SG88	28	108	SAI	TSH	-12.55	0.64	21	-12.55	58		0.23	
2004	SG88	44	60	SCI	TSH	-12.73	3.16	38	-12.73	99	81		
2004	SG88	65	53	SCI	TSH	-12.74	2.59	38	-12.74	95	108		
2004	SG88	65	47	SCI	TSH	-12.79	0.69	25	-12.79	54	31		
2004	SG88	82	84	MCI	TSH	-13.09	0.63	22	-13.09	47	111		
2004	SG88	21	51	SCI	TSH	-13.13	0.67	32	-13.13	70	40		
2004	SG88	26	140	SCI	TSH	-13.39	1.97	36	-13.39	91	36		
2004	SG88	28	108	SAI	TSH	-13.55	0.88	21	-13.55	61		0.15	
2004	SG88	82	82	SCI	TSH	-13.89	0.33	14	-13.89				
2004	SG88	34	40	SCI	TSH	-14.24	0.43	18	-14.24				
2004	SG88	31	125	SCI	TSH	-14.41	1.47	35	-14.41	89	39		
2004	SG88	98	56	SCI	TSH	-14.48	3.20	33	-14.48	92	50		
2004	SG88	34	32	SCI	TSH	-14.60	1.82	31	-14.60	85	55		
2004	SG88	51	107	SCI	TSH	-15.08	0.79	18	-15.08	61	27		
2004	SG88	34	40	SCI	TSH	-15.31	0.40	13	-15.31				
2004	SG88	51	107	SCI	TSH	-15.57	0.82	26	-15.57	67	31		
2004	SG88	28	42	SAI	TSH	-16.49	0.36	14	-16.49				
2004	SG88	51	107	SCI	TSH	-16.50	1.21	28	-16.50	75	31		
2004	SG88	87	83	SCI	TSH	-16.77	0.40	18	-16.77				
2004	SG88	37	25	SAI	TSH	-17.22	0.60	18	-17.22	51		0.34	
2004	SG88	37	25	SAI	TSH	-17.40	0.27	16	-17.40				

Location Abbreviations	
TSH	Top-of-Tubesheet, Hot Leg
SBH	Sleeve Bottom, Hot Leg
TEH	Tube End, Hot Leg

Appendix 2 - -San Onofre Unit 2 Steam Generator E-088 Indications Within the Tubesheet in 2004



Appendix 3 - San Onofre Unit 2

Steam Generator E-089

Axial and Circumferential Indications At or Below The Top-of-Tubesheet

Outage	SG	Row	Col	Ind	Elevation		Volts	Degrees	Location Relative To Top-of-Tubesheet	Depth (%)	Circ Length (degrees)	Axial Length (inches)	OD? Yes or Blank If No
2004	SG89	82	76	SCI	TSH	0.00	0.20	26	0.00				
2004	SG89	8	114	SCI	TSH	0.00	0.31	17	0.00				
2004	SG89	43	65	SCI	TSH	-0.05	0.14	97	-0.05				Yes
2004	SG89	81	125	SCI	TSH	-0.05	0.55	25	-0.05	60	51		
2004	SG89	24	60	SCI	TSH	-0.06	0.29	20	-0.06				
2004	SG89	39	67	SAI	TSH	-0.07	0.30	114	-0.07				Yes
2004	SG89	28	42	SCI	TSH	-0.08	0.35	27	-0.08				
2004	SG89	78	74	SCI	TSH	-0.09	0.62	25	-0.09	40	42		
2004	SG89	57	103	MCI	TSH	-0.10	0.63	18	-0.10	49	99		
2004	SG89	24	152	SCI	TSH	-0.11	0.39	24	-0.11				
2004	SG89	27	147	SCI	TSH	-0.11	0.25	30	-0.11				
2004	SG89	56	38	SCI	TSH	-0.14	0.27	20	-0.14				
2004	SG89	51	51	SCI	TSH	-0.15	0.45	20	-0.15				
2004	SG89	10	140	SCI	TSH	-0.35	0.15	20	-0.35				
2004	SG89	45	73	SAI	TSH	-0.42	0.37	11	-0.42				
2004	SG89	45	73	SAI	TSH	-0.72	0.47	16	-0.72				
2004	SG89	142	86	SCI	TSH	-0.88	1.09	15	-0.88	41	54		
2004	SG89	8	114	SAI	TSH	-1.02	0.38	14	-1.02				
2004	SG89	39	73	SAI	TSH	-1.21	0.43	18	-1.21				
2004	SG89	46	72	SAI	TSH	-2.67	0.37	17	-2.67				
2004	SG89	2	118	SCI	TSH	-3.06	0.27	20	-3.06				
2004	SG89	45	67	SAI	TSH	-3.44	0.49	18	-3.44				
2004	SG89	47	41	SAI	TSH	-3.48	0.55	10	-3.48	32		0.19	
2004	SG89	4	10	SAI	TSH	-3.84	0.42	10	-3.84				
2004	SG89	138	110	SAI	TSH	-4.26	0.31	11	-4.26				
2004	SG89	36	126	SCI	TSH	-4.32	0.32	26	-4.32				
2004	SG89	45	47	SAI	TSH	-4.74	0.33	26	-4.74				
2004	SG89	114	34	SAI	TSH	-5.00	0.30	8	-5.00				
2004	SG89	116	106	SAI	TSH	-5.02	0.35	16	-5.02				
2004	SG89	8	114	SCI	TSH	-5.80	0.31	16	-5.80				
2004	SG89	38	116	SAI	TSH	-6.02	0.66	20	-6.02	53		0.15	
2004	SG89	77	115	SCI	TSH	-6.40	0.31	23	-6.40				
2004	SG89	2	118	SCI	TSH	-6.46	0.50	16	-6.46				
2004	SG89	36	132	SCI	TSH	-6.64	0.50	22	-6.64				
2004	SG89	26	110	SAI	TSH	-7.21	1.17	22	-7.21	54		0.2	
2004	SG89	95	93	SCI	TSH	-7.33	1.17	28	-7.33	67	28		
2004	SG89	12	138	SCI	TSH	-7.34	1.94	33	-7.34	82	71		
2004	SG89	29	127	MCI	TSH	-7.59	0.46	27	-7.59				
2004	SG89	39	127	SCI	TSH	-7.81	1.57	27	-7.81	69	37		
2004	SG89	5	115	SCI	TSH	-7.82	0.85	28	-7.82	58	27		
2004	SG89	22	62	SAI	TSH	-8.16	0.43	18	-8.16				
2004	SG89	36	134	SCI	TSH	-8.22	0.35	18	-8.22				
2004	SG89	46	44	SAI	TSH	-8.24	3.53	31	-8.24	92		0.49	
2004	SG89	12	120	SCI	TSH	-8.27	0.80	30	-8.27	50	37		
2004	SG89	9	147	MCI	TSH	-8.28	1.41	26	-8.28	68	125		
2004	SG89	33	127	SCI	TSH	-8.34	1.27	30	-8.34	82	33		
2004	SG89	9	131	MCI	TSH	-8.53	2.36	37	-8.53	100	236		
2004	SG89	42	124	MCI	TSH	-8.55	0.82	30	-8.55	54	206		
2004	SG89	16	58	SCI	TSH	-8.56	0.88	29	-8.56	69	36		

Appendix 3 - San Onofre Unit 2

Steam Generator E-089

Axial and Circumferential Indications At or Below The Top-of-Tubesheet

Outage	SG	Row	Col	Ind	Elevation		Volts	Degrees	Location Relative To Top-of-Tubesheet	Depth (%)	Circ Length (degrees)	Axial Length (inches)	OD? Yes or Blank if No
2004	SG89	22	62	SAI	TSH	-8.82	0.42	17	-8.82				
2004	SG89	97	107	SAI	TSH	-8.96	1.01	18	-8.96	53		0.17	
2004	SG89	78	64	SAI	TSH	-9.18	1.85	27	-9.18	78		0.32	
2004	SG89	39	73	SAI	TSH	-9.19	0.64	21	-9.19	60		0.18	
2004	SG89	95	77	SAI	TSH	-9.20	2.11	25	-9.20	78		0.37	
2004	SG89	39	127	SCI	TSH	-9.34	14.03	46	-9.34	96	189		
2004	SG89	78	64	SAI	TSH	-9.35	0.89	21	-9.35	60		0.15	
2004	SG89	4	126	MCI	TSH	-9.35	1.62	36	-9.35	84	126		
2004	SG89	9	35	SCI	TSH	-9.50	3.22	34	-9.50	100	76		
2004	SG89	14	124	SAI	TSH	-9.52	1.72	27	-9.52	74		0.22	
2004	SG89	9	127	MCI	TSH	-9.73	3.54	37	-9.73	100	308		
2004	SG89	15	37	SCI	TSH	-9.74	0.29	19	-9.74				
2004	SG89	78	64	SAI	TSH	-9.76	0.40	13	-9.76				
2004	SG89	39	73	SAI	TSH	-10.15	4.06	35	-10.15	100		0.86	
2004	SG89	18	118	SCI	TSH	-10.19	0.33	28	-10.19				
2004	SG89	38	40	SCI	TSH	-10.21	0.84	28	-10.21	60	28		
2004	SG89	9	131	SCI	TSH	-10.31	1.18	22	-10.31	80	28		
2004	SG89	78	64	SAI	TSH	-10.51	0.96	26	-10.51	73		0.2	
2004	SG89	78	64	SAI	TSH	-10.68	1.36	24	-10.68	70		0.17	
2004	SG89	9	131	MCI	TSH	-10.73	1.14	29	-10.73	91	178		
2004	SG89	29	127	MCI	TSH	-10.82	1.17	32	-10.82	77	225		
2004	SG89	78	64	SAI	TSH	-10.99	0.26	14	-10.99				
2004	SG89	9	131	SCI	TSH	-11.17	3.31	34	-11.17	100	76		
2004	SG89	18	128	SCI	TSH	-11.20	0.55	14	-11.20	57	34		
2004	SG89	42	124	MCI	TSH	-11.31	1.19	25	-11.31	67	116		
2004	SG89	71	71	SAI	TSH	-11.36	2.77	34	-11.36	100		0.45	
2004	SG89	47	41	SAI	TSH	-11.41	0.50	10	-11.41				
2004	SG89	18	128	SCI	TSH	-11.61	3.75	34	-11.61	93	53		
2004	SG89	85	113	SAI	TSH	-11.79	1.61	17	-11.79	47		0.2	
2004	SG89	95	141	SAI	TSH	-12.01	0.79	11	-12.01	30		0.14	
2004	SG89	39	69	SCI	TSH	-12.09	0.62	17	-12.09	63	23		
2004	SG89	82	112	SAI	TSH	-12.24	0.91	20	-12.24	50		0.25	
2004	SG89	95	141	SAI	TSH	-12.35	1.23	14	-12.35	39		0.17	
2004	SG89	42	124	SAI	TSH	-12.60	0.80	17	-12.60	46		0.13	
2004	SG89	85	113	SAI	TSH	-12.78	2.35	18	-12.78	50		0.42	
2004	SG89	89	111	SAI	TSH	-12.99	3.22	29	-12.99	84		0.43	
2004	SG89	82	112	SAI	TSH	-13.10	1.14	16	-13.10	41		0.15	
2004	SG89	82	112	SAI	TSH	-13.28	1.41	18	-13.28	47		0.22	
2004	SG89	89	87	SAI	TSH	-13.33	0.52	17	-13.33	45		0.13	
2004	SG89	82	112	SAI	TSH	-13.65	1.98	19	-13.65	53		0.37	
2004	SG89	75	139	MAI	TSH	-13.75	2.48	22	-13.75	77		0.63	
2004	SG89	51	61	SAI	TSH	-14.07	0.89	21	-14.07	60		0.18	
2004	SG89	9	131	SCI	TSH	-14.44	0.68	33	-14.44	68	32		
2004	SG89	46	136	SAI	TSH	-14.55	0.94	24	-14.55	67		0.18	
2004	SG89	46	136	SAI	TSH	-14.76	1.14	24	-14.76	64		0.18	
2004	SG89	46	130	SAI	TSH	-14.96	1.49	21	-14.96	61		0.17	
2004	SG89	108	110	MAI	TSH	-14.99	1.26	25	-14.99	62		0.22	
2004	SG89	112	120	SAI	TSH	-15.78	2.52	25	-15.78	67		0.44	
2004	SG89	24	60	SAI	TSH	-15.96	0.54	22	-15.96	54		0.15	

Appendix 3 - San Onofre Unit 2

Steam Generator E-089

Axial and Circumferential Indications At or Below The Top-of-Tubesheet

Outage	SG	Row	Col	Ind	Elevation		Volts	Degrees	Location Relative To Top-of-Tubesheet	Depth (%)	Circ Length (degrees)	Axial Length (inches)	OD? Yes or Blank if No
2004	SG89	47	45	SAI	TEH	6.43	2.80	31	-16.57	93		0.42	
2004	SG89	81	131	SCI	TSH	-16.67	1.24	15	-16.67	46	56		
2004	SG89	25	109	SAI	TSH	-18.05	0.98	28	-18.05	74		0.25	
2004	SG89	65	151	SAI	TSH	-18.48	0.53	14	-18.48	39		0.12	
2004	SG89	9	63	SAI	TSH	-19.01	2.56	33	-19.01	100		0.72	
2004	SG89	22	66	SCI	TEH	0.83	0.42	24	-22.17				

Location Abbreviations	
TSH	Top-of-Tubesheet, Hot Leg
SBH	Sleeve Bottom, Hot Leg
TEH	Tube End, Hot Leg

Appendix 4 - San Onofre Unit 2 Steam Generator E-089 Indications Within the Tubesheet in 2004