

Diablo Canyon Power Plant – 1R11
May 20, 2002
Steam Generator Tube Inspection Results

Areas of discussion:

1. Primary to secondary leakage prior to shutdown:

A small P/S leak of 1.03 gpd existed prior to shutdown. It was first detected in August 1998. Leakage during the most recent cycle averaged 1-2 gpd. It is thought to be in SG 1-4 based on tritium analysis. There is a high probability this leakage is through a plug.

2. Results of secondary side hydro:

No secondary hydro was performed because the small leak rate would make it very difficult to find the leak with a secondary pressure test.

3. For each steam generator, a general description of areas examined; include expansion criteria and specify type of probe used in each area:

See attached table from the Degradation Assessment.

4. For analyzed EC results, describe bobbin indications (those not examined with RPC) and MRPC/Plus Point indications. Include the following information: location, number, degradation mode, disposition, and voltages/depths/lengths of most significant indications:

Discussion.

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

Discussion.

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

Discussion.

7. Discuss in general any new inspection findings, including loose parts indications.

Discussion.

8. Discuss your use or reliance on the X-probe, if applicable.

The x probe was used to inspect 6 tubes in the WEXTEx area. This was for information only. These tubes had been inspected with +Point.

9. Describe in-situ pressure test plans and results; include tube selection criteria, test pressure plans, test configuration:

No in-situ testing was performed.

10. Describe tube pull plans and preliminary results; include tube selection criteria and evaluation plans:

No tubes were pulled.

11. Discuss assessment of tube integrity for previous operating cycle:

All inspection findings met the performance criteria for structural and accident induced leakage. Largest flaws by category will be discussed.

12. Discuss assessment of tube integrity for next operating cycle:

Based on the size of detected flaws, historical flaw growth rates, and planned cycle length, all tubes will retain adequate margin for structural and leakage integrity over the next cycle.

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

Nozzle dams will be removed this afternoon.

14. Discuss what steps have been taken, or will be taken, in response to the lessons learned from the Indian Point Unit 2 tube failure.

Data quality and noise criteria have been established for Row 1 & 2 U bend data. Vertical RMS noise was measured in each tube U bend at both tangents and the apex. Noise measurements were compared with the EPRI ETSS 96 511 data set. Nine tubes were plugged because the U bend data did not meet the noise criteria.

In addition, please be prepared to discuss the following:

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

The DA would be updated to define inspection scope, techniques, etc for the new degradation in the current inspection. The finding would be entered into PG&E's corrective action program (i.e., an AR would be initiated). The preliminary OA would be modified to address the new degradation. Growth rates and supporting information would be obtained as possible and the 90 day OA would address cycle length with the new degradation mechanism.

- b) Discuss the actions taken to ensure that data noise levels are acceptable:

See item 13 above for U bends. Noise criteria have also been implemented for other + Point and bobbin inspection data.

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

See item 14 above for U bends. Data quality criteria have also been implemented for other + Point and bobbin inspection data.

Table 1 - 1R11 SG Tube Inspection and Expansion Plan					
	Area	Probe	Inspection Criteria	ECT Inspections	Expansion Criteria
1	Full Length	Bobbin	100%	13026	N/A
2	Short Radius U-Bends	+Point	100% - Rows 1 and 2 U-bends in all SGs 20% - Row 3 U-bends in SG 11 and SG 13	692 R1&2 38 R3	If SCC found in Row 2, inspect 20% of Row 3 in affected SG. If SCC found in Row 3, inspect 100% of Row 3 and 20% of Row 4 in affected SG. Continue expansion in this manner until a flaw free 20% sample is obtained in the next row U-bend
3	WEXTEX TTS Region	+Point	<ul style="list-style-type: none"> 100% of HL TTS Extent is +2" to -8" PTE/NTE anomaly extent is +2 to tube end 	13026	If C-3 condition is identified in HL TTS, inspect 20% of CL TTS in affected SG. If indications found in CL, follow EPRI Tables 3-1 and 3-2 for further expansion requirements. If cracking found in HL tubesheet anomalies, inspect 100% of CL tubesheet anomalies.
4	Repeat PWSCC at dents and TTS	+Point	<ul style="list-style-type: none"> 100% 	112	N/A
5	≥5 volt dents	+Point	<ul style="list-style-type: none"> SG 1-1: 100% at 1H to 4H, 20% at 5H to 7H SG 1-2: 100% at 1H to 6H, 20% at 7H SG 1-3: 20% at 1H to 7H SG 1-4: 100% at 1H to 3H, 20% at 4H to 7H For each 20% sample, inspect at least 50 dents, or else inspect 100% if there are less than 50 dents 	1264	If PWSCC (at any size dent), circumferential indications (at any size dent), or AONDB (at ≥5 volt dent) are detected at a TSP elevation where 100% inspections were not required, expand the Plus Point inspections (in a step-wise manner, 100% to affected TSP and 20% at next TSP) up through the hot leg side of the SG and down the cold leg side until a 20% sample is obtained that is free from PWSCC, circumferential cracking, or ≥ 2 inferred volt AONDB
6	>2 and <5 volt dents	+Point	<ul style="list-style-type: none"> SG 1-1: 100% at 1H to 4H, 20% at 5H SG 1-2: 100% at 1H to 6H, 20% at 7H SG 1-3: 20% at 1H SG 1-4: 100% at 1H to 3H, 20% at 4H For each 20% sample, inspect at least 50 dents, or else inspect 100% if there are less than 50 dents 	1531	If PWSCC (at any size dent), circumferential indications (at any size dent), or ≥ 2 inferred volt AONDB (at >2 and <5 volt dent) are detected at a TSP elevation where 100% inspections were not required, expand the Plus Point inspections (in a step-wise manner, 100% to affected TSP and 20% at next TSP) up through the hot leg side of the SG and down the cold leg side until a 20% sample is obtained that is free from PWSCC, circumferential cracking, or ≥ 2 inferred volt AONDB

7	Distorted ID support plate bobbin signals (DIS)	+Point	<ul style="list-style-type: none"> 100% of DIS calls by bobbin 	600 DIS, assuming Plus Point confirmation of 60 new axial PWSCC indications (similar to 1R10), with 90% overcall rate by bobbin	If a circ indication or ≥ 2 inferred volt AONDB is detected in a dent of "x" volts, then Plus Point inspections shall be conducted on 100% of dents greater than "x - 0.3" volts up to the affected TSP, plus 20% of dents greater than "x - 0.3" volts at the next higher TSP. "x" is defined as the lowest dent voltage where a circ crack or ≥ 2 inferred volt AONDB was detected in that SG. Note: For any 20% sample, a minimum of 50 "x - 0.3" volt dents shall be inspected. If the population of "x - 0.3" volt dents at that TSP elevation is less than 50, then 100% of the "x - 0.3" volt dents at that TSP shall be inspected.
8	Distorted OD support plate bobbin signals (DOS) and voltage-based ARC implementation	+Point	<ul style="list-style-type: none"> DOS at < 5 volt dented intersections ≥ 2 volt DOS DOS with suspected TSP ligament cracking DOS in the wedge region exclusion zone DOS at 7th TSP exclusion zone DOS that extend outside the TSP crevice copper signals Mix residuals: all HL intersections > 2.3 SPR volts, and minimum of 5 largest HL SPR per SG (CDS determines SPR voltage at each TSP) 	132 DOS 20 SPR	N/A
9	Suspected TSP Ligament Cracking (SLC)	+Point	<ul style="list-style-type: none"> Plus Point inspect 20% of existing baseline indications, satisfied by 100% inspection of baseline indications in SG 11 and 14 Plus Point inspect all new bobbin SLC indications <p><u>Bobbin analysis:</u></p> <ul style="list-style-type: none"> CDS of 1R11 bobbin data to identify SLC Low frequency bobbin review of TSP at intersections with distorted support signals to identify SLC 	86 baseline inspections, plus any new SLC calls	If active degradation is detected in the 20% sample inspection, then the Plus Point inspection will be expanded to 100 percent of the baseline population. Active degradation is defined as service-induced TSP ligament erosion-corrosion and/or cracking.
10	Free Span Dings (> 2 volts)	+Point	<ul style="list-style-type: none"> In each SG, 20% from TSH to 7H 	79	If PWSCC is found in 20% sample, then expand inspections in the affected SG by inspecting 100% of >2 volt dings up to affected free span
11	Mechanical Plugs	Visual	Visual inspection of all existing plugs to verify they are intact and show no signs of leaking		
12	Cold Leg Thinning	+Point	<ul style="list-style-type: none"> New CLT indications CLT indications in the wedge zone 	10	N/A

13	Free Span Bobbin Indications	+Point	100% of free span bobbin indications that are new or exhibit growth or change (MBI, FSI, DNI)	12	N/A
14	Loose Parts	Bobbin +Point	<ul style="list-style-type: none"> • Review bobbin data of row 1&2 and penphery tubes • +Point of PLP and surrounding tubes • +Point of loose parts detected by FOSAR 	10	N/A
15a	Deplugged Tubes full length	Bobbin	<ul style="list-style-type: none"> • 100% 	150	N/A
15b	Deplugged Tubes WEXTEX region	+Point	<ul style="list-style-type: none"> • 100% of HL TTS • Extent is +2" to -8" 	150	N/A
15c	Deplugged Tubes TSP	+Point	<ul style="list-style-type: none"> • Onginal flawed TSP • 100% of DOS and DIS, regardless of voltage • 100% of >2 volt hot leg dents • 100% of SLC indications 	375	N/A