(3)

Indian Point Unit 2

- W 4-loop plant with Model 44 SGs, Alloy 600 Tubes
  - Replacement SGs with Alloy 600 tubes are on site. (Have been there for quite some time).
- Received OL in Sept 73
- SG Tube Degradation Summary
  - denting (severe, including hourglassing)
  - pitting
  - ODSCC at support plate intersections
  - ODSCC in sludge pile
  - ODSCC in TS crevice
  - PWSCC at roll transitions
  - PWSCC in U-bends
  - Broken plugs (explosive type)
- SGs last inspected in Spring 1997
  - 100% of tubes inspected full length
  - Insitu pressure testing of 6 tubes, including axial indication above TS
  - 173 tubes plugged
- Total plugging to date:
  - SG 21 - 313 tubes (9.6%)
  - SG 22 - 405 tubes (12.4%)
  - SG 23 - 301 tubes (9.2%)
  - SG 24 - 306 tubes (9.4%) * - the one that ruptured
- IP-2 restart from refueling/inspection outage on June 13, 1997
- Oct 27, 1997 to August 5, 1998: maintenance outage
- Tech Specs require inspections every 24 calendar months. Thus, reinspection of the Sgs was required by June 1999.

B|46

(3)

- Licensee requested and staff approved 10-month extension of the required inspection interval to June 2, 2000 because plant was down for 10 months when no further SGT degradation would be allowed

  - By June 2, 2000, IP-2 will have accumulated 26 calendar operating months or 21.5 EFPM
  - Basis:
    - layup conditions were maintained during maintenance outage consistent with the EPRI guidelines.
    - During operation, secondary water chemistry was maintained in accordance with EPRI guidelines with no significant chemistry transients reported.
    - Operational assessment was performed by licensee for each degradation mechanism. The results indicated that tube integrity would be maintained through the end of the current fuel cycle (June 2, 2000).
    - Multiple methods available for the early detection of SG leakage, including N-16 monitors. Administrative leakage limits in place which are more restrictive than TS LCO limits.

- IP-2 has had a very low level of primary to secondary leakage (slightly above 1 gpd total, all SGs) in three of the four SGs since October 1999. N-16 monitor indicated that leakage in SG 24 increased slightly to 1.5 gpd on Feb 6, 2000. No information currently available beyond that date.

- SGTR history summary is attached.

Table 12. Summary of the leak rate, degradation mechanism, rupture size, rupture location, and stressor information associated with the ten ruptures discussed in Section 4.

Date	Plant, SG Model	Maximum Leak Rate GPM	Degradation Mechanism	Rupture Size	Rupture Location	Stressors and Contributing Factors
02/26/75	Point Beach-1 W-44	125	Wastage	2 adjacent ruptured bulges each about 20 mm long and wide	Slightly above the tubesheet, outer row on the hot leg side	Large sludge pile, ineffective cleaning
09/15/76	Surry-2 W-51	330[1]	PWSCC	114.3 mm long axial crack	Top of U-bend (apex) in Row 1, Column 7	High stresses and ovalization caused by inward movement of the legs due to support plate deformation
06/25/79	Doel-2 ACE-44	135	PWSCC	100 mm long axial crack	Top of the U-bend in Row 1, Column 24	High residual stresses due to ovalization during fabrication
10/02/79	Prairie Is.-1 W-51	336[1]	Loose Parts Wear	38 mm long axial fishmouth opening	Tube bundle outer surface, 76 mm above the tubesheet on the hot leg side, Row 4, Column 1	Sludge lancing equipment left in the steam generator
01/25/82	Ginna W-44	760[1]	Loose Parts Wear, Fretting	100 mm long axial fishmouth opening	127 mm above the tubesheet on the hot leg side, Row 42, Column 55 (third row in from the bundle periphery)	Loose parts (baffle plate debris) left in the steam generator, wear of peripheral tubes, fretting of inner tubes
05/16/84	Fort Calhoun CE	112	ODSCC	32 mm long axial crack (small fishmouth opening)	Horizontal run at the top, between the vertical batwing support bars on the hot leg side, Row 84, Column 29, the rupture faced down	Tube deformation caused by corrosion of the vertical batwing support bars, caustic impurities on the secondary side
07/15/87	North Anna-1 W-51	637	High-Cycle Fatigue	360° circumferential break	Top of the 7th upper tube support plate on the cold leg side, Row 9, Column 51	High-cycle vibration, denting, lack of AVB support
03/07/89	McGuire-1 W-D2	500	ODSCC	95 mm long axial crack in a 645 mm long groove, 9.5 mm wide at the maximum point	711 mm above the tubesheet at the lower tube support plate on the cold leg side, Row 18, Column 25	Long shallow groove, possibly a contaminant
02/09/91	Mihama-2 MH1-44	≈700[2]	High-Cycle Fatigue	360° circumferential break	Top of the 6th (upper) tube support plate on the cold leg side, Row 14, Column 45	High-cycle vibration, lack of AVB support
03/14/93	Palo Verde-2 CE-80	240	ODSCC	65 mm long axial fishmouth opening in a 250 mm long axial crack	Freespan region between the 08H and 09H tube support structures on the hot leg side, Row 117, Column 144	Tube-to-tube crevice formation, bridging deposits, caustic secondary water chemistry, susceptible material

[1]NRC estimates
[2]Estimate based on similarities to the North Anna rupture