Calvert Cliffs Nuclear Power Plant

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

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CALVERT CLIFFS
NUCLEAR POWER PLANT

June 30, 2011

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 2; Docket No. 50-318
Spring 2011 – 180 Day Steam Generator Report

REFERENCE: (a) Calvert Cliffs Nuclear Power Plant Units 1 and 2 Technical Specification 5.6.9

In accordance with Reference (a), Attachment (1) provides the results of the steam generator tube inspection conducted on Calvert Cliffs Unit 2 in 2011. This report includes the number and extent of tubes examined and indications identified.

Should you have questions regarding this matter, please contact Mr. Douglas E. Lauver at (410) 495-5219.

Very truly yours,

James J. Stanley
Manager – Engineering Services

JJS/PSF/bjd

Attachment: (1) Calvert Cliffs Unit 2, Spring 2011 – 180 Day Steam Generator Report

cc: D. V. Pickett, NRC
W. M. Dean, NRC
Resident Inspector, NRC
S. Gray, DNR

A001
NRC

ATTACHMENT (1)

CALVERT CLIFFS UNIT 2, SPRING 2011 –

180 DAY STEAM GENERATOR REPORT

Calvert Cliffs Nuclear Power Plant, LLC
June 30, 2011

AREVA

AREVA NP Inc.

ENGINEERING INFORMATION RECORD

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Calvert Cliffs Unit 2 -- U2R19 180-Day Report

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Does this document contain assumptions requiring verification? ☐ YES ☒ NO

Does this document contain Customer Required Format? ☐ YES ☒ NO

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1.0 180-DAY REPORT

Calvert Cliffs Nuclear Power Plant Unit 2
U2R19 Spring 2011 Steam Generator Inspection

During the Calvert Cliffs Nuclear Power Plant Unit 2 (CCNPP2) spring 2011 refueling outage (designated as U2R19), both of the steam generators (i.e., SG21 and SG22) were inspected in accordance with CCNPP Technical Specification (TS) 5.5.9. This was the third in-service inspection of the replacement steam generators (SGs), and the SGs had been operated for 7.45 effective full power years (EFPY) at the time of the inspection.

The discussion below summarizes the results of the inspection in accordance with the 180-day reporting requirements of Technical Specification (TS) 5.6.9. **Bold** wording restates the TS requirement, followed immediately by the required CCNPP2 information.

A report shall be submitted within 180 days after the initial entry into Mode 4 following completion of an inspection performed in accordance with the Specification 5.5.9, Steam Generator (SG) Program.

Initial entry into Mode 4 occurred on March 12, 2011; therefore, this report is required to be submitted by September 7, 2011.

The report shall include:

a. The scope of inspections performed on each SG

- Eddy Current Bobbin probe examinations (both SGs):
  - 100% of all inservice tubes, full length, tube-end to tube-end.
  - During the bobbin probe examination, in-service tubes bounding plugged tubes were examined for signs of tube-to-tube proximity or contact (resulting from severance of a plugged tube).
- Eddy Current Array probe examinations (both SGs):
  - 100% of all inservice tubes, tube end to 1st lattice-support (both H/L and C/L).
  - Since all of the in-service tubes were examined with Array probe from the tube-end to the 1st lattice support, the following examinations were also satisfied by the Array probe examination: (Note that any loose parts or loose part indications outside of the Array probe examination range were examined using RPC. Additionally, any wear detected during the Array probe examination was also examined using RPC for characterization.)

- Inspection of a one-tube border region around all tubes previously plugged due to foreign object wear and/or object remaining in the SG. This included 30 tubes plugged in SG21 during U2R18, and 29 tubes plugged in SG22 during U2R16.
- Inspection of all previous PLPs (part not removed) plus a one tube bounding examination of such tubes at the elevation of interest. This included 59 PLP tubes (plus the bounding tubes) returned to service in SG21 during U2R18, and 27 PLP tubes (plus the bounding tubes) returned to service in SG22 during U2R18.
- Inspection of all in-service tubes reported during the previous outage as NDD or LPS that were associated with foreign objects not retrieved during that outage, plus a one tube bounding examination of such tubes at the elevation of interest. This included 25 tubes (plus the bounding tubes) reported in SG21 during U2R18, and 30 tubes (plus bounding tubes) reported in SG22 during U2R18.

- The Array probe inspection data was also analyzed for expansion transition cracking at the hot and cold leg top of tubesheet (TTS)

- Rotating eddy current probe examination (RPC) (both SGs):

  - Pre-planned: Inspection of all in-service tube locations containing previously identified foreign object wear. This included 5 tubes in SG21 (all reported for the first time during U2R18) and, 6 tubes in SG22 (4 reported for the first time during U2R16 and 2 reported for the first time during U2R18).

  - Special interest examinations:

    - All bobbin probe and/or Array probe I-Codes.
    - All newly-identified foreign object wear indications.
    - All bobbin probe loose part indications plus a one tube bounding examination of such tubes that fall outside of the Array probe examination range.
    - All bobbin probe lattice-support wear indications.
    - Additional indications (e.g., fan bar wear, dents, dings) as needed to meet operational assessment requirements for tube integrity.

- Visual inspection of all installed tube plugs in both SGs in accordance with section 6.9 of the EPRI PWR Steam Generator Examination Guidelines, Rev 7. This included both welded and mechanical plugs.

- The following secondary side inspections were performed (both SGs):

  - Secondary side visual inspections of tubesheet, including the inner bundle passes, the annulus, and the no-tube lane regions

  - Secondary side visual inspection of the 1st lattice grid support

  - Targeted inspection of locations identified as PLP (Possible Loose Part) by ECT. See the latter part of Section "d" for an explanation of targeted inspections.

b. Active degradation mechanisms found

Two degradation mechanisms were identified during this examination: 1) fan bar wear, and 2) foreign object wear. No evidence of corrosion degradation processes, cracking, or lattice support wear was identified and no tubes were identified as being in close proximity to one another.

c. Nondestructive examination techniques utilized for each degradation mechanism

The table below identifies NDE examination techniques utilized for each identified degradation mechanism.

Table 1 – NDE Techniques Utilized for Identified Degradation

Degradation Mechanism	Inspection Type	EPRI ETSS
Fan bar wear	Bobbin	96004.1 (Rev. 13)
	+Point™	96910.1 (Rev. 10)
Foreign Object Wear*	+Point™	27901.1 (Rev. 0) ** (circ groove)

* The Array probe was the primary means of detecting foreign objects and foreign object wear during the inspection. However, the +Point™ probe was used for sizing wear.

** There are other EPRI techniques qualified for sizing of foreign object wear depending on the shape of the flaw. ETSS 27901.1 was selected based on the circumferential groove appearance of the foreign object wear indications detected during the U2R19 inspection.

d. Location, orientation (if linear), and measured sizes (if available) of service induced indications

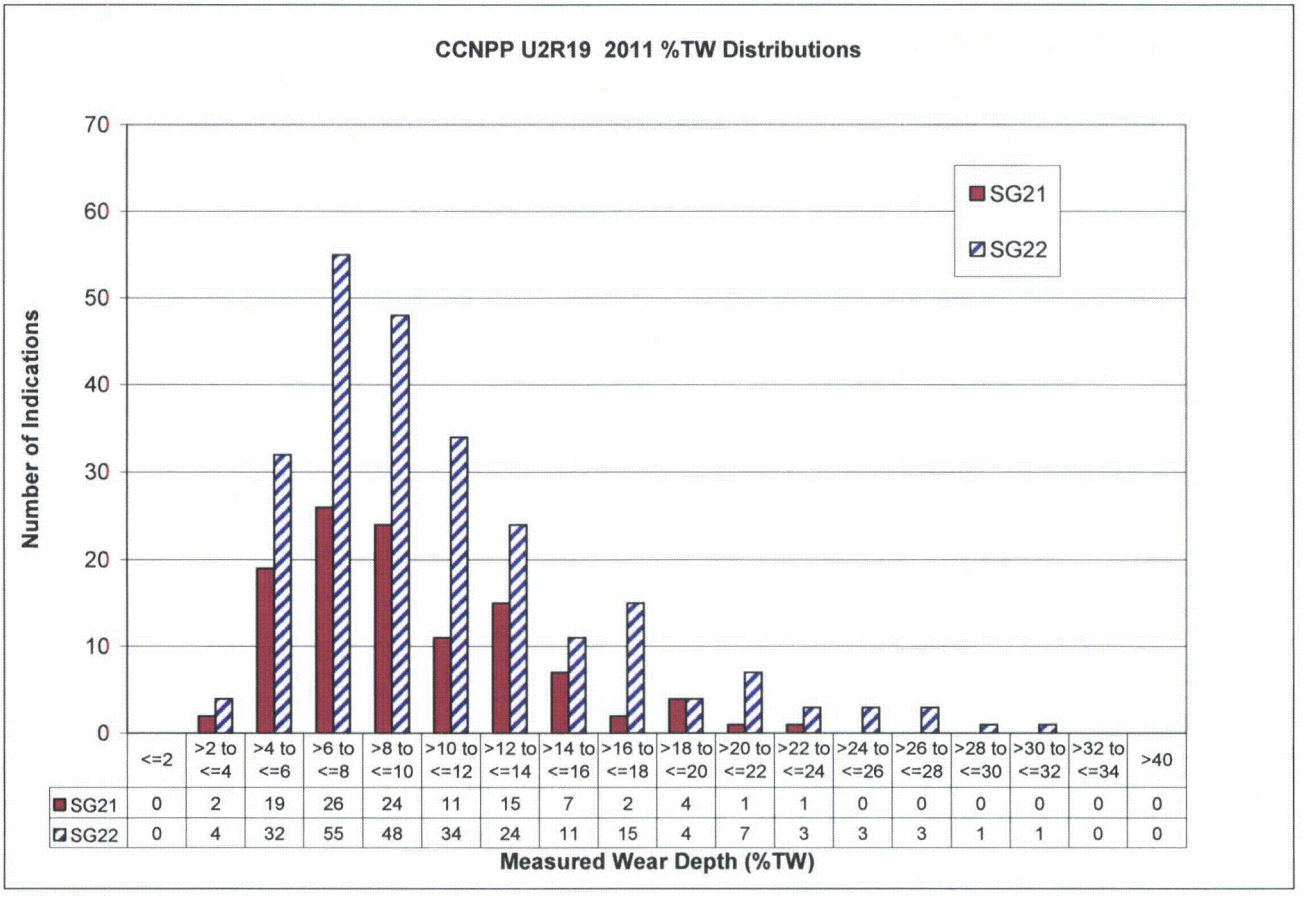
Fan bar wear (FBW) is a mechanical degradation process which produces volumetric tube wear at the interface between the U-bend anti-vibration supports (fan bars) and the tubes. In total, 358 fan bar wear (FBW) indications in 274 tubes were identified in the CCNPP2 steam generators during the U2R19 inspection. Although none of the reported indications exceeded the Technical Specification plugging limit of 40%TW, the three largest FBW indications (all in SG22) were preventatively stabilized with full-length stabilizers, and the tubes were plugged. Although the full length stabilizer is not required to span the entire tube length, it is required to span the tube length on the insertion leg side (hot leg) from the top of the plug over the u-bend and past the 5th support on the opposite leg for the largest tube row (row 138) in the bundle.

Thirty-one of the 358 indications were newly reported during U2R19. This represents an increase of about 10% since the last inservice inspection in 2009 (U2R18). The maximum depth reported was a 32%TW indication in SG22. The largest newly-reported indication was an 18%TW indication in SG22. Figure 1 provides the distribution of fan bar wear depths for both steam generators as reported with the

bobbin coil probe. As shown in the figure, SG22 contained more indications and also contained the majority of indications that were greater than 20%TW.

Figures 2 and 3 provide tube map locations of the reported FBW. Although the tube maps shown in Figures 2 and 3 provide a view of the tubesheet primary face from the hot leg side, both the hot leg and cold leg FBW indications are included on each map. Most of the wear continues to occur in longer tubes (i.e., larger ubend radius), clustered towards the center-most tube columns.

Figure 1 – Fan Bar Wear Throughwall Depth Distribution



	<=2	>2 to <=4	>4 to <=6	>6 to <=8	>8 to <=10	>10 to <=12	>12 to <=14	>14 to <=16	>16 to <=18	>18 to <=20	>20 to <=22	>22 to <=24	>24 to <=26	>26 to <=28	>28 to <=30	>30 to <=32	>32 to <=34	>40
SG21	0	2	19	26	24	11	15	7	2	4	1	1	0	0	0	0	0	0
SG22	0	4	32	55	48	34	24	11	15	4	7	3	3	3	1	1	0	0

Figure 2 – SG21 Fan Bar Wear Locations

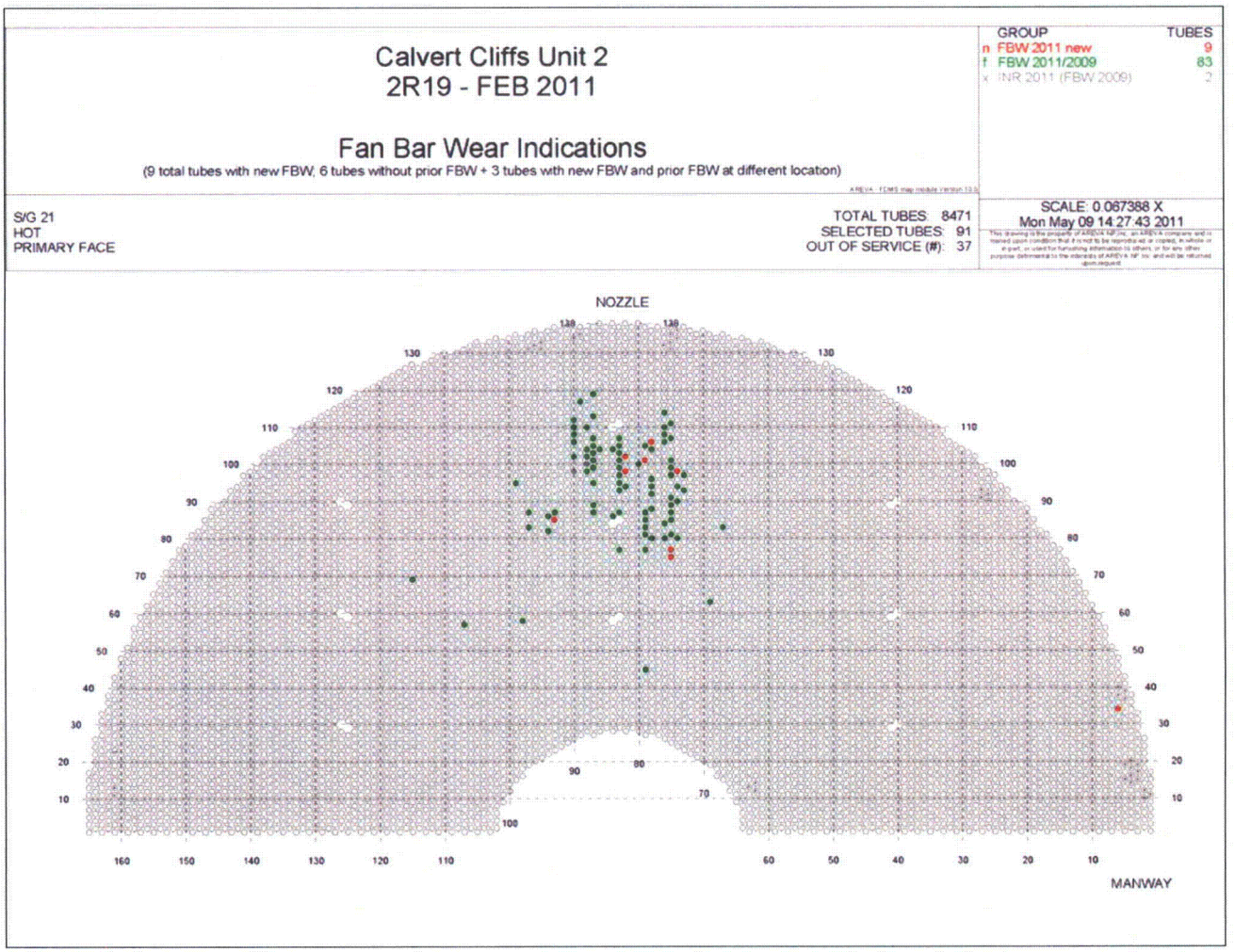
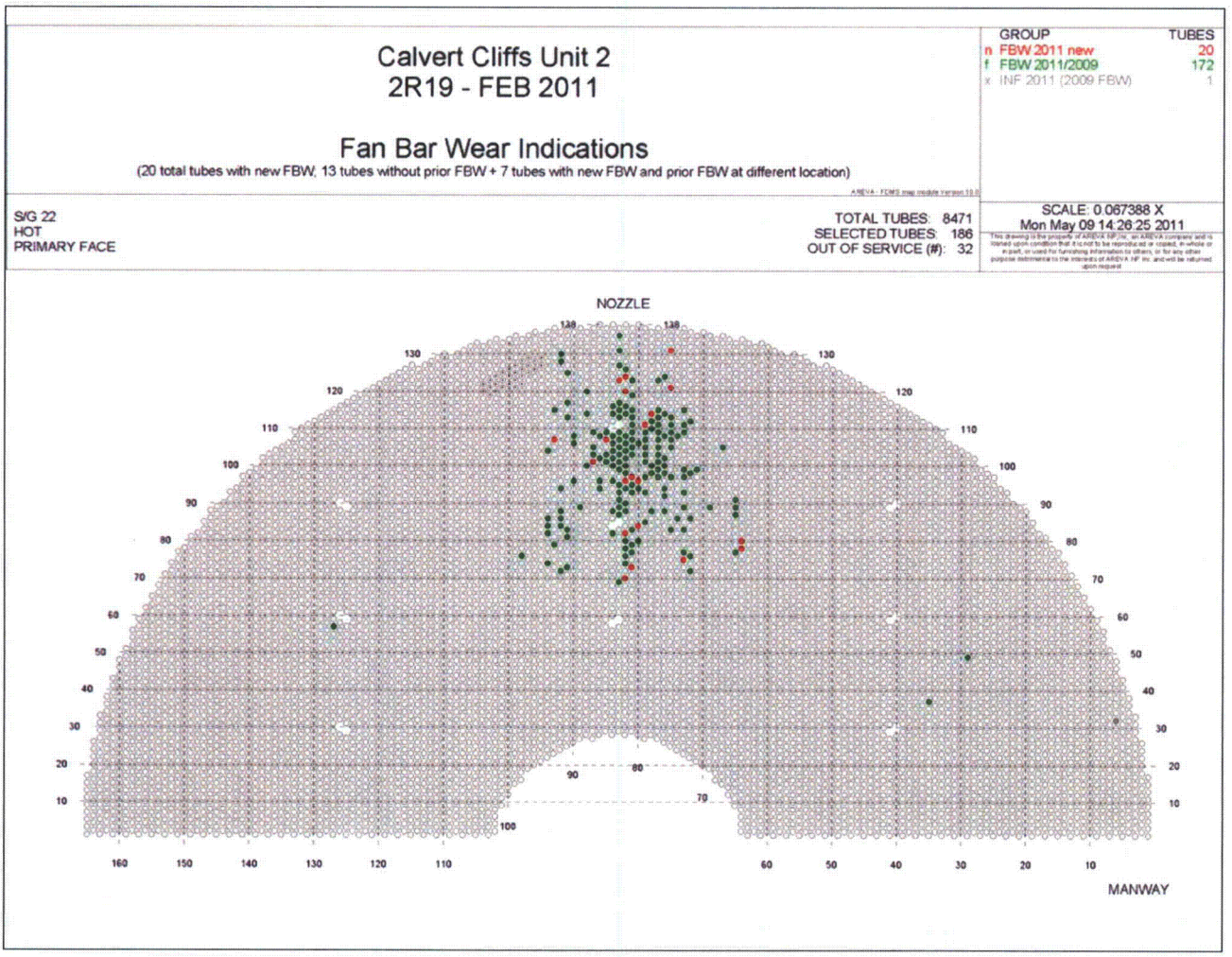


Figure 3 – SG22 Fan Bar Wear Locations



During the U2R19 inspection, 17 indications of foreign object wear were detected in 14 tubes within the two SGs (see Table 2). These indications were reported as LPW (Loose Part Wear) in the eddy current database. Five (5) indications in three tubes were newly-detected in SG21 during U2R19. The remaining indications in SG21, and all indications in SG22, were identified during prior inspections, and were pre-planned for re-inspection during U2R19. All LPW indications were sized below the site plugging limit. None of the foreign objects that caused the newly-detected LPW in 2011 was present at the LPW tube location. Nor were objects present at non-plugged LPW tube locations from previous outages. Since no objects were present to cause further wear and all LPW %TWs were less than the 40% tech spec plugging limit, all 14 tubes were returned to service.

Due to the large number of LPW indications and foreign objects detected at CCNPP2 in the past, a concerted effort was undertaken during U2R19 to detect and remove as many foreign objects as possible. A 100% examination of both SGs was performed with the Array probe from the tube end to the first support in each leg. This provided the most thorough inspection possible for detection of foreign objects from the tubesheet up to the first support in both legs. As a result, 343 Potential Loose Part (PLP) indications were reported in SG21, and 203 were recorded in SG22. It should be noted that these quantities represent the initial number of PLP indications in the ECT database. Upon inspecting a location, the indication code was subsequently changed to LPS (Loose Parts Signal) if no loose part was found by visual inspection, or LPR (Loose Part Removed) if any object (including a sludge rock) was found and removed from the SG. Thus the stated quantities are actually the sum of PLP, LPS and LPR calls remaining in the database.

With certain justified exceptions (Refs. 1 and 2), all PLP indications were visually investigated by secondary side inspection personnel. This included loose parts left in service from the previous (2009) inspection. PLP locations that were not visually inspected were justified by a separate engineering evaluation. The evaluation divided the bundle into two parts: the 12-tube periphery ring and all tubes bounded by the periphery ring, (i.e., the inner bundle region). PLP indications located within the inner bundle region were further divided into two classifications, IBS (inner bundle single) and all other. IBS indications are defined as PLP indications located in a single tube without a PLP indication in an adjacent bounding tube. Since IBS indications were judged to be less of a concern regarding tube integrity, (compared to two or more adjacent PLP tubes), visual inspection of IBS tubes was not required. Of the 343 PLP indications detected in SG21, 92 of them were classified as IBS indications. Accordingly, of the 203 PLP indications detected in SG22, 69 of them were classified as IBS indications. The majority of PLPs were caused by sludge rocks and/or scale. Numerous metallic objects were removed, and three small pieces of wire were left in SG22 secondary side.

Table 2 – Foreign Object Wear

SG	Row	Col	Ind	%TW	Supp	Elevation	Eddy Current Technique	Measured Length (in.) Axial X Circ	New in 2011	Loose Part Detected
21	12	66	LPW	29	TSH	+0.12	27901.1	0.21 x 0.33	Yes	No
21	12	66	LPW	23	TSH	+0.42	27901.1	0.18 x 0.31	Yes	No
21	12	162	LPW	27	TSH	+0.04	27901.1	0.18 x 0.33	No	No
21	13	65	LPW	28	TSH	+0.01	27901.1	0.21 x 0.23	Yes	No
21	14	66	LPW	18	TSH	+0.50	27901.1	0.15 x 0.25	Yes	No
21	14	66	LPW	18	TSH	+0.60	27901.1	0.12 x 0.27	Yes	No
21	72	146	LPW	34	TSH	+0.15	27901.1	0.13 x 0.35	No	No
21	75	147	LPW	19	TSH	+18.07	27901.1	0.25 x 0.25	No	No
21	77	147	LPW	22	TSH	+17.70	27901.1	0.24 x 0.29	No	No
21	77	149	LPW	21	TSH	+20.71	27901.1	0.21 x 0.39	No	No
22	14	4	LPW	24	TSC	+0.47	27901.1	0.20 x 0.35	No	No
22	17	1	LPW	24	TSC	-0.02	27901.1	0.20 x 0.27	No	No
22	18	2	LPW	25	TSC	+0.10	27901.1	0.24 x 0.31	No	No
22	112	82	LPW	24	05H	-4.02	27901.1	0.31 x 0.35	No	No
22	124	116	LPW	17	01C	-11.40	27901.1	0.27 x 0.27	No	No
22	126	116	LPW	37	01C	-11.27	27901.1	0.27 x 0.27	No	No
22	126	116	LPW	23	01C	-11.54	27901.1	0.24 x 0.27	No	No

e. Number of tubes plugged during the inspection outage for each active degradation mechanism

Three tubes in SG22 were plugged during U2R19 (see Table 3). All of the tubes were preventatively stabilized and plugged due to Fan Bar wear. The tubes are labeled as PTP (Preventive Tube Plug) in the ECT database. No tubes were plugged in SG21 during the 2011 refueling outage.

Table 3 – List of Tubes Plugged During U2R19

SG	Row	Col	Hot Leg	Cold Leg	Reason for Tube Repair
SG22	109	73	ROLLSTAB	ROLLED	PTP@F06-1.35
SG22	99	83	ROLLSTAB	ROLLED	PTP@F06+0.02
SG22	101	83	ROLLSTAB	ROLLED	PTP@F06-0.02

PTP = Preventative Tube Plug ROLLSTAB=Stabilizer and Rolled Plug

f. Total number and percentage of tubes plugged to date

Table 4 provides the post-U2R19 tube plugging status of the CCNPP2 SGs. There are currently 37 tubes plugged in SG21 and 32 tubes plugged in SG22.

Table 4 – Tube Plugging Summary

SG	Tubes Installed	Tubes Plugged To-Date
SG21	8,471	37 (0.437%)
SG22	8,471	32 (0.378%)
Total	16,942	69 (0.407%)

g. The results of condition monitoring, including the results of tube pulls and in-situ testing

The condition monitoring assessment is summarized in Figures 4 through 6. These figures provide the condition monitoring limit curves corresponding to the NDE technique employed for each degradation type. All reported degradation falls below the applicable condition monitoring curve and therefore satisfies the Technical Specification structural performance criteria.

Note that Figures 4 and 5 display the U2R19 FBW depths at a bounding 1.8 inch length for SGs 21 and 22 respectively. Also presented in each figure are the five deepest FBW indications sized using RPC. The five deepest were selected since larger axial lengths are typically associated with deeper FBW. The measured RPC length for these indications is plotted to demonstrate that the 1.8 inch length remains bounding. Because the RPC length measurements were not adjusted to compensate for rotating coil field spread effects, the indicated length values are considered to be overestimates of the actual lengths, thus adding to the conservatism for the 1.8 inch bounding length.

For volumetric indications, meeting the structural performance criteria also provides reasonable assurance that the accident leakage performance criteria would be satisfied at the steam line break pressure differential which is less challenging than the pressure differential required to demonstrate compliance with the structural performance criteria. Since this conclusion could be reached analytically using NDE inspection results with a full accounting of significant uncertainties, no in-situ pressure testing was required to demonstrate structural and leakage integrity, and no tubes were removed from the SGs for destructive examination. During the past operating cycle, no measurable primary-to-secondary leakage was observed, therefore the operational leakage performance criteria was satisfied. The results of the 2011 inspection and the condition monitoring assessment confirm that the 2009 operational assessment was appropriately bounding.

h. The effective plugging percentage for all plugging in each SG

There are no sleeves installed in the CCNPP2 steam generators, therefore the effective plugging percentage is the same as stated in (f) above.

Figure 4 – SG21 Fan Bar Wear Condition Monitoring

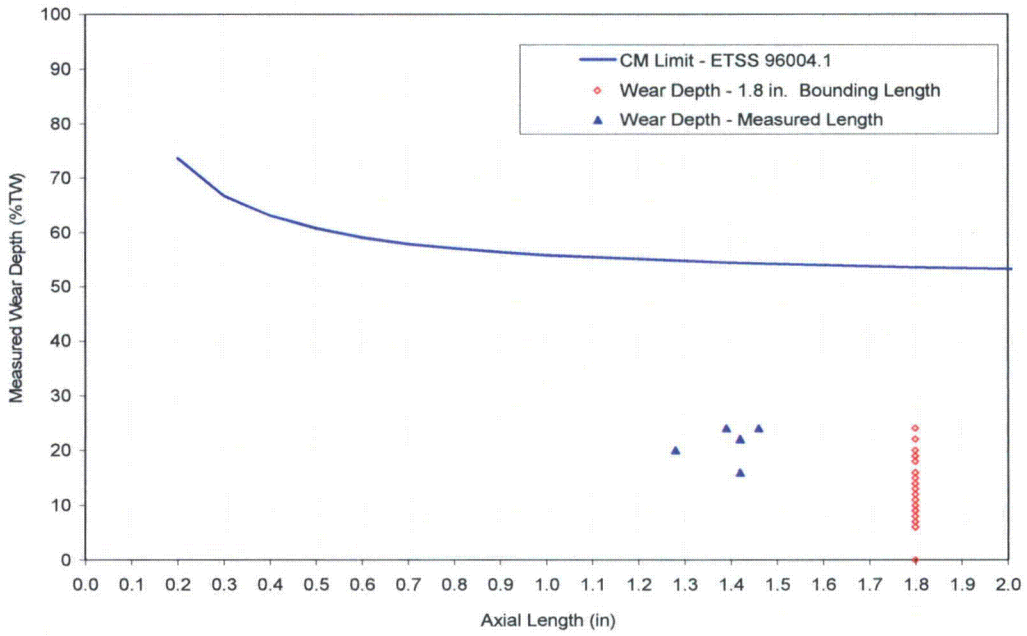


Figure 5 – SG22 Fan Bar Wear Condition Monitoring

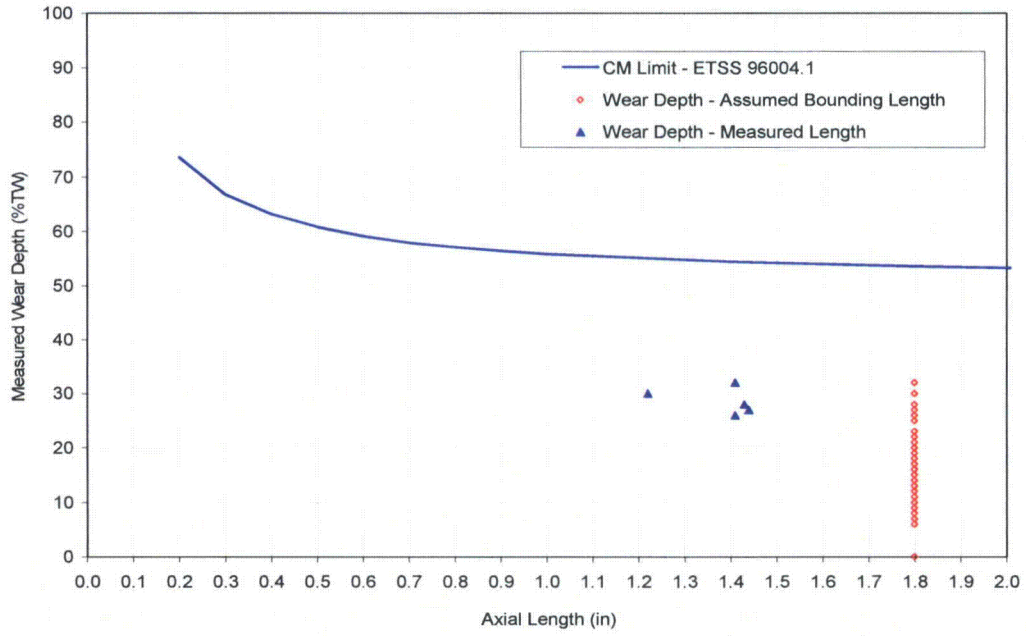
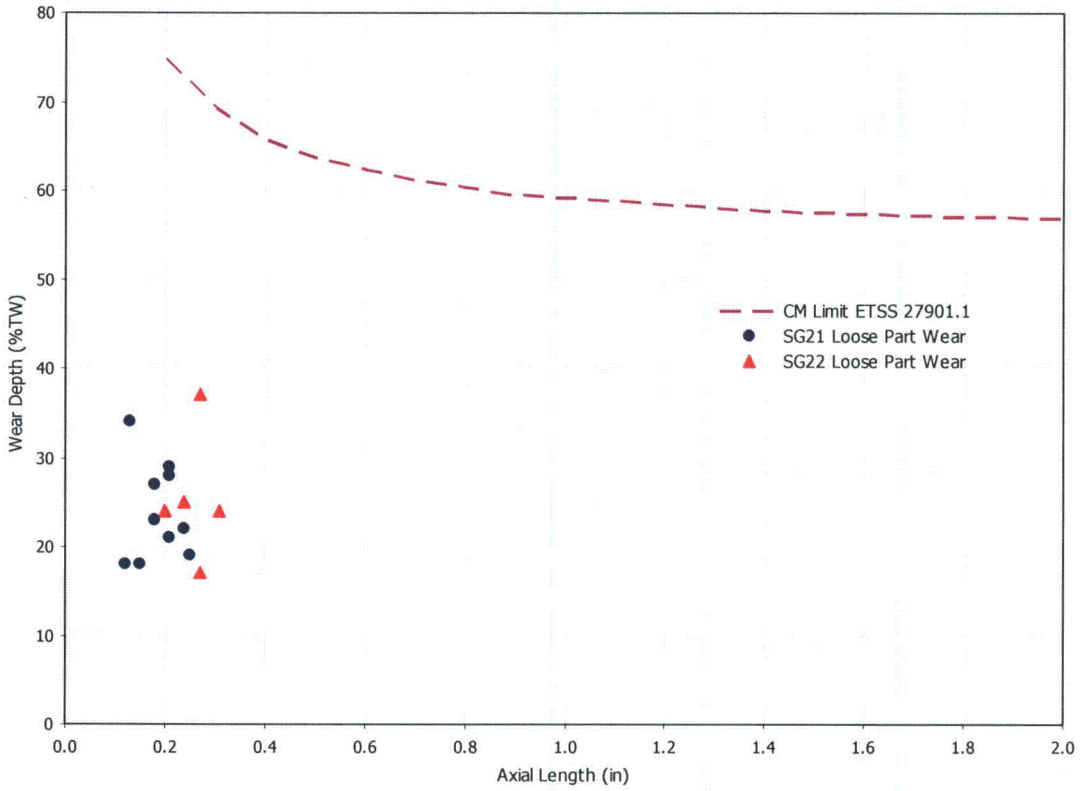


Figure 6 – SG21 and SG22 LP Wear Condition Monitoring



2.0 REFERENCES

1. AREVA CR 2011-1545
2. AREVA CR 2011-1547
3. AREVA, "Calvert Cliffs Unit-2 Condition Monitoring at 2R19 (Spring 2011) and Preliminary Operational Assessment for Cycles 19 and 20," 51-9156699-000, March 8, 2011
4. AREVA, "Technical Summary Calvert Cliffs Unit#2 2R19 Eddy Current Examination," 51-9157178-000, May 10, 2011
5. AREVA, "Calvert Cliffs Nuclear Power Plant Unit 2, SG Degradation Assessment, Spring 2011 / 2R19," 51-9153318-000, February 15, 2011

APPENDIX A: SG21 FBW INDICATIONS

SG	Row	Col	Ind	%TW	Supp	Inch1
SG21	34	6	TWD	9	F06	-1.4
SG21	45	79	TWD	5	F07	0.92
SG21	57	107	TWD	19	F08	1.69
SG21	58	98	TWD	5	F05	-1.82
SG21	63	69	TWD	9	F09	2.16
SG21	69	115	TWD	9	F04	-1.9
SG21	75	75	TWD	6	F08	0.75
SG21	77	75	TWD	6	F08	0.71
SG21	77	79	TWD	18	F08	0.75
SG21	77	83	TWD	10	F08	0.78
SG21	80	74	TWD	4	F08	2.03
SG21	80	76	TWD	14	F07	-0.81
SG21	80	78	TWD	9	F08	1.99
SG21	81	75	TWD	13	F08	0.77
SG21	81	79	TWD	13	F08	0.92
SG21	82	94	TWD	7	F08	0.81
SG21	83	67	TWD	11	F08	0.77
SG21	83	79	TWD	10	F08	0.92
SG21	83	97	TWD	6	F08	2
SG21	84	76	TWD	14	F07	-0.81
SG21	85	75	TWD	7	F08	0.83
SG21	85	75	TWD	5	F07	1.79
SG21	85	79	TWD	13	F08	0.94
SG21	85	93	TWD	11	F08	1.91
SG21	86	84	TWD	12	F06	-0.72
SG21	86	94	TWD	8	F08	0.74
SG21	87	75	TWD	16	F08	0.81
SG21	87	75	TWD	9	F07	1.75
SG21	87	79	TWD	9	F08	0.76
SG21	87	83	TWD	14	F06	0.48
SG21	87	87	TWD	8	F08	1.97
SG21	87	93	TWD	10	F08	2.02
SG21	87	97	TWD	7	F08	1.93
SG21	88	78	TWD	9	F06	1.24
SG21	89	75	TWD	13	F06	-0.59
SG21	89	87	TWD	10	F08	1.33
SG21	89	87	TWD	7	F07	0.72
SG21	90	74	TWD	7	F08	2.02
SG21	91	75	TWD	9	F08	0.81
SG21	92	78	TWD	11	F08	1.99
SG21	93	73	TWD	14	F08	0.74
SG21	93	83	TWD	9	F06	-0.62
SG21	94	74	TWD	9	F06	-1.83

SG	Row	Col	Ind	%TW	Supp	Inch1
SG21	94	78	TWD	14	F08	1.94
SG21	94	82	TWD	9	F06	-1.49
SG21	95	83	TWD	15	F08	-0.59
SG21	95	83	TWD	13	F07	-0.57
SG21	95	87	TWD	16	F08	1.92
SG21	95	87	TWD	8	F09	0.74
SG21	95	99	TWD	6	F05	-1.3
SG21	96	78	TWD	7	F08	1.58
SG21	97	73	TWD	10	F08	0.66
SG21	97	75	TWD	9	F06	-0.61
SG21	97	75	TWD	8	F07	1.82
SG21	97	83	TWD	9	F08	0.5
SG21	97	83	TWD	6	F07	-0.07
SG21	98	74	TWD	9	F06	-1.55
SG21	98	74	TWD	6	F08	1.99
SG21	98	82	TWD	7	F06	-1.81
SG21	98	82	TWD	7	F08	1.99
SG21	98	88	TWD	6	F08	0.66
SG21	99	75	TWD	12	F07	1.73
SG21	99	83	TWD	14	F06	-0.52
SG21	99	83	TWD	14	F08	-0.63
SG21	99	83	TWD	11	F07	-0.61
SG21	99	87	TWD	13	F06	-1.38
SG21	100	80	TWD	6	F06	-1.33
SG21	101	75	TWD	16	F06	-0.7
SG21	101	75	TWD	12	F07	1.64
SG21	101	75	TWD	6	F09	-1.49
SG21	101	79	TWD	8	F06	-0.46
SG21	101	79	TWD	8	F08	0.74
SG21	101	79	TWD	7	F02	-1.6
SG21	101	79	TWD	6	F07	1.6
SG21	101	83	TWD	10	F07	-0.48
SG21	101	83	TWD	9	F08	-0.39
SG21	101	87	TWD	10	F07	0.66
SG21	101	87	TWD	7	F06	-1.53
SG21	102	82	TWD	5	F07	-1.43
SG21	102	88	TWD	6	F06	-0.55
SG21	102	90	TWD	7	F06	-0.61
SG21	103	83	TWD	12	F06	0.46
SG21	103	87	TWD	12	F07	0.92
SG21	104	78	TWD	7	F08	1.88
SG21	104	78	TWD	6	F07	0.79
SG21	104	84	TWD	7	F06	-0.48
SG21	104	86	TWD	4	F06	-0.52
SG21	104	88	TWD	20	F05	-1.5
SG21	104	88	TWD	19	F06	-1.1
SG21	104	88	TWD	6	F07	1.77

SG	Row	Col	Ind	%TW	Supp	Inch
SG21	105	79	TWD	6	F07	1.96
SG21	105	83	TWD	12	F07	0.02
SG21	105	87	TWD	7	F07	0.66
SG21	106	76	TWD	22	F06	1.34
SG21	106	76	TWD	8	F07	-0.72
SG21	106	78	TWD	6	F07	0.7
SG21	106	90	TWD	7	F06	-0.55
SG21	107	75	TWD	9	F07	1.71
SG21	107	83	TWD	14	F06	0.46
SG21	107	83	TWD	10	F07	-0.11
SG21	107	87	TWD	16	F07	0.99
SG21	108	76	TWD	24	F06	1.01
SG21	108	90	TWD	16	F06	-0.81
SG21	110	76	TWD	7	F06	0.72
SG21	110	88	TWD	7	F06	-0.63
SG21	110	90	TWD	8	F06	-0.24
SG21	111	75	TWD	19	F06	-0.72
SG21	112	90	TWD	18	F06	-0.79
SG21	113	87	TWD	7	F07	0.74
SG21	114	76	TWD	12	F06	-0.72
SG21	117	89	TWD	15	F06	-1.62
SG21	119	87	TWD	14	F07	0.81

APPENDIX B: SG22 FBW INDICATIONS

SG	Row	Col	Ind	%TW	Supp	Inch1
SG22	37	35	TWD	4	F07	1.85
SG22	49	29	TWD	7	F07	1.88
SG22	57	127	TWD	5	F05	-1.95
SG22	69	83	TWD	7	F08	-0.56
SG22	70	82	TWD	11	F06	-1.92
SG22	70	82	TWD	9	F07	0.86
SG22	72	72	TWD	9	F08	1.99
SG22	72	92	TWD	13	F08	0.81
SG22	73	81	TWD	7	F07	-1.25
SG22	73	91	TWD	14	F08	1.93
SG22	74	82	TWD	7	F06	-1.72
SG22	74	82	TWD	6	F08	2.03
SG22	74	82	TWD	5	F07	0.74
SG22	74	94	TWD	9	F08	0.89
SG22	75	73	TWD	8	F08	0.82
SG22	76	72	TWD	17	F08	1.95
SG22	76	72	TWD	10	F06	-1.84
SG22	76	82	TWD	12	F06	-1.33
SG22	76	82	TWD	11	F08	2.02
SG22	76	82	TWD	8	F07	0.85
SG22	76	98	TWD	10	F08	0.86
SG22	77	65	TWD	10	F08	0.78
SG22	77	73	TWD	8	F08	0.98
SG22	77	81	TWD	6	F07	-0.81
SG22	78	64	TWD	7	F08	1.95
SG22	78	82	TWD	11	F06	-1.84
SG22	79	81	TWD	14	F07	-0.78
SG22	79	93	TWD	26	F08	1.44
SG22	80	64	TWD	12	F09	-1.94
SG22	80	80	TWD	9	F06	-1.61
SG22	80	82	TWD	9	F06	-1.95
SG22	80	82	TWD	8	F05	-0.63
SG22	81	91	TWD	8	F08	2.07
SG22	82	82	TWD	10	F07	1.29
SG22	82	82	TWD	7	F06	-1.83
SG22	82	84	TWD	9	F08	1.29
SG22	82	84	TWD	8	F06	1.44
SG22	82	94	TWD	7	F08	0.79
SG22	83	73	TWD	21	F08	0.83
SG22	83	75	TWD	12	F02	1.03
SG22	83	81	TWD	19	F07	-1.17
SG22	83	91	TWD	14	F08	1.99
SG22	84	80	TWD	11	F06	-1.81

SG	Row	Col	Ind	%TW	Supp	Inch1
SG22	84	92	TWD	17	F08	0.8
SG22	84	94	TWD	18	F08	0.83
SG22	85	79	TWD	9	F08	0.94
SG22	86	72	TWD	11	F06	-1.59
SG22	86	72	TWD	9	F05	-0.76
SG22	86	74	TWD	9	F06	-1.56
SG22	86	92	TWD	9	F08	0.83
SG22	86	94	TWD	13	F08	0.87
SG22	87	65	TWD	16	F08	0.78
SG22	87	83	TWD	22	F07	-0.02
SG22	87	83	TWD	15	F08	0.02
SG22	87	83	TWD	7	F06	0.5
SG22	88	76	TWD	9	F06	1.94
SG22	88	78	TWD	10	F06	-1.29
SG22	88	82	TWD	12	F06	1.3
SG22	88	82	TWD	11	F05	1.83
SG22	88	84	TWD	6	F07	-0.72
SG22	88	92	TWD	11	F08	0.85
SG22	89	65	TWD	14	F08	1.07
SG22	89	69	TWD	11	F08	1
SG22	89	73	TWD	18	F08	0.91
SG22	89	83	TWD	9	F06	0.59
SG22	89	83	TWD	8	F08	-0.55
SG22	89	83	TWD	7	F05	-0.39
SG22	89	83	TWD	6	F07	0.57
SG22	89	89	TWD	5	F08	-1.27
SG22	90	82	TWD	6	F06	-1.83
SG22	91	65	TWD	20	F08	0.87
SG22	91	83	TWD	7	F07	-0.46
SG22	92	76	TWD	11	F06	1.88
SG22	93	73	TWD	6	F06	-0.7
SG22	93	79	TWD	7	F06	-0.68
SG22	93	81	TWD	5	F06	-0.74
SG22	93	83	TWD	10	F07	0.5
SG22	93	83	TWD	9	F06	0.48
SG22	94	76	TWD	7	F06	1.58
SG22	94	80	TWD	7	F06	-1.73
SG22	94	82	TWD	14	F06	-1.81
SG22	94	82	TWD	6	F07	0.87
SG22	94	86	TWD	8	F06	0.85
SG22	94	92	TWD	10	F08	0.89
SG22	95	81	TWD	8	F07	-1.22
SG22	95	83	TWD	10	F07	0.52
SG22	95	83	TWD	7	F06	0.59
SG22	96	80	TWD	10	F06	-1.79
SG22	96	82	TWD	9	F06	1.3

SG	Row	Col	Ind	%TW	Supp	Inch1
SG22	96	82	TWD	5	F07	-1.49
SG22	96	84	TWD	17	F07	1.35
SG22	96	86	TWD	9	F06	-1.05
SG22	96	90	TWD	14	F08	-1.31
SG22	97	73	TWD	8	F06	-0.72
SG22	97	75	TWD	7	F06	-0.5
SG22	97	77	TWD	7	F06	-0.72
SG22	97	79	TWD	7	F06	-0.61
SG22	97	81	TWD	8	F07	-1.27
SG22	97	81	TWD	3	F06	1.38
SG22	97	81	TWD	3	F08	-1.53
SG22	98	72	TWD	6	F08	1.92
SG22	98	76	TWD	7	F06	1.71
SG22	98	78	TWD	10	F08	2.08
SG22	98	82	TWD	7	F07	0.9
SG22	99	71	TWD	13	F08	-0.81
SG22	99	73	TWD	7	F07	1.93
SG22	99	77	TWD	18	F06	-1.02
SG22	99	83	TWD	28	F06	0.07
SG22	99	83	TWD	15	F05	0
SG22	100	76	TWD	8	F06	-1.79
SG22	100	78	TWD	11	F08	-1.85
SG22	100	78	TWD	6	F06	-1.51
SG22	100	82	TWD	23	F06	-1.21
SG22	100	82	TWD	16	F07	0.91
SG22	100	82	TWD	9	F08	1.8
SG22	100	84	TWD	8	F07	1.95
SG22	100	88	TWD	11	F07	1.86
SG22	101	77	TWD	9	F06	-0.67
SG22	101	79	TWD	7	F07	1.84
SG22	101	83	TWD	30	F06	0.09
SG22	101	83	TWD	23	F07	0.09
SG22	101	83	TWD	9	F05	0.04
SG22	101	85	TWD	6	F09	1.42
SG22	101	87	TWD	7	F07	0.76
SG22	101	87	TWD	6	F04	0.7
SG22	102	76	TWD	12	F07	-1.27
SG22	102	76	TWD	7	F06	1.77
SG22	102	82	TWD	8	F09	0.85
SG22	102	82	TWD	7	F06	-1.77
SG22	102	84	TWD	5	F07	1.94
SG22	102	86	TWD	6	F02	0.9
SG22	103	77	TWD	16	F06	-0.61
SG22	103	79	TWD	10	F06	-0.62
SG22	103	79	TWD	9	F07	1.96
SG22	103	81	TWD	9	F08	-1.31

SG	Row	Col	Ind	%TW	Supp	Inch1
SG22	103	83	TWD	17	F06	-0.06
SG22	103	83	TWD	7	F05	-0.52
SG22	103	83	TWD	7	F07	-0.13
SG22	103	85	TWD	10	F08	1.4
SG22	103	87	TWD	12	F07	0.7
SG22	104	82	TWD	11	F06	-1.76
SG22	104	82	TWD	11	F07	0.74
SG22	104	84	TWD	12	F07	1.84
SG22	104	94	TWD	14	F06	-1.15
SG22	105	67	TWD	9	F07	-1.31
SG22	105	75	TWD	9	F06	-0.74
SG22	105	77	TWD	11	F06	-0.74
SG22	105	79	TWD	17	F06	-0.59
SG22	105	79	TWD	11	F07	1.75
SG22	105	81	TWD	14	F08	1.35
SG22	105	81	TWD	9	F06	-0.74
SG22	105	81	TWD	6	F07	1.81
SG22	105	83	TWD	15	F07	0.57
SG22	105	83	TWD	13	F05	0
SG22	105	83	TWD	8	F06	0.04
SG22	105	87	TWD	7	F01	0.61
SG22	106	80	TWD	8	F07	1.44
SG22	106	82	TWD	17	F07	0.79
SG22	106	82	TWD	11	F06	-1.72
SG22	106	84	TWD	6	F08	-1.42
SG22	106	90	TWD	18	F07	1.39
SG22	107	75	TWD	14	F06	-0.79
SG22	107	77	TWD	14	F06	-0.76
SG22	107	79	TWD	9	F06	-0.75
SG22	107	81	TWD	22	F06	-0.74
SG22	107	81	TWD	12	F08	-1.26
SG22	107	83	TWD	13	F07	0.07
SG22	107	83	TWD	5	F06	0.02
SG22	107	83	TWD	4	F05	0.12
SG22	107	85	TWD	18	F09	0.7
SG22	107	93	TWD	11	F07	0.81
SG22	108	74	TWD	7	F06	-1.9
SG22	108	76	TWD	14	F08	1.72
SG22	108	82	TWD	21	F07	0.81
SG22	108	82	TWD	16	F09	0.87
SG22	108	82	TWD	10	F08	1.68
SG22	108	84	TWD	14	F07	1.82
SG22	108	84	TWD	13	F06	-0.61
SG22	108	86	TWD	23	F06	-1.03
SG22	108	86	TWD	15	F07	1.25
SG22	108	86	TWD	6	F08	1.33

SG	Row	Col	Ind	%TW	Supp	Inch1
SG22	108	90	TWD	7	F06	-0.7
SG22	109	73	TWD	32	F06	-1.2
SG22	109	75	TWD	13	F06	-0.83
SG22	109	77	TWD	18	F06	-0.66
SG22	109	79	TWD	21	F06	-0.72
SG22	109	81	TWD	14	F08	-1.46
SG22	109	81	TWD	12	F06	-0.74
SG22	109	81	TWD	6	F07	-1.18
SG22	109	83	TWD	5	F06	0.56
SG22	109	85	TWD	17	F07	-1.33
SG22	109	87	TWD	11	F07	0.87
SG22	110	78	TWD	9	F07	0.72
SG22	111	73	TWD	27	F06	-1.25
SG22	111	75	TWD	22	F06	-0.7
SG22	111	77	TWD	27	F06	-0.85
SG22	111	79	TWD	19	F06	-0.69
SG22	111	79	TWD	11	F07	1.83
SG22	111	81	TWD	14	F06	-0.74
SG22	112	72	TWD	10	F08	1.88
SG22	112	78	TWD	12	F07	0.79
SG22	113	75	TWD	8	F06	-0.81
SG22	113	77	TWD	26	F06	-1.22
SG22	113	81	TWD	19	F06	-1.16
SG22	113	83	TWD	9	F07	0.61
SG22	113	83	TWD	7	F06	0.5
SG22	113	91	TWD	18	F02	-1.91
SG22	114	76	TWD	5	F06	1.32
SG22	114	78	TWD	12	F07	0.75
SG22	114	82	TWD	8	F06	1.33
SG22	114	84	TWD	12	F06	-1.18
SG22	114	88	TWD	15	F05	1.28
SG22	115	73	TWD	9	F06	-0.68
SG22	115	77	TWD	9	F06	-0.68
SG22	115	81	TWD	7	F06	1.28
SG22	115	81	TWD	6	F07	-1.22
SG22	115	83	TWD	6	F06	0.57
SG22	115	83	TWD	6	F07	0.63
SG22	115	93	TWD	12	F07	0.88
SG22	116	82	TWD	22	F07	1.25
SG22	116	84	TWD	9	F08	-1.66
SG22	117	83	TWD	18	F06	0.13
SG22	117	83	TWD	6	F05	-0.42
SG22	117	83	TWD	5	F08	0.09
SG22	117	91	TWD	15	F07	1.33
SG22	119	81	TWD	14	F06	-0.61
SG22	120	82	TWD	6	F08	1.24

SG	Row	Col	Ind	%TW	Supp	Inch1
SG22	120	88	TWD	9	F08	-1.27
SG22	121	75	TWD	11	F06	-0.79
SG22	123	77	TWD	6	F06	-0.61
SG22	123	81	TWD	11	F07	1.53
SG22	123	83	TWD	25	F07	0.33
SG22	123	83	TWD	8	F06	0.59
SG22	123	83	TWD	6	F05	0.28
SG22	124	76	TWD	8	F06	0.76
SG22	124	82	TWD	13	F06	-1.29
SG22	124	82	TWD	9	F08	-1.37
SG22	124	82	TWD	7	F09	-1.4
SG22	125	91	TWD	9	F03	-1.95
SG22	126	82	TWD	15	F07	1.16
SG22	127	83	TWD	13	F07	0.22
SG22	128	92	TWD	7	F08	-1.25
SG22	130	92	TWD	10	F06	1.78
SG22	131	75	TWD	9	F06	-1.29
SG22	131	83	TWD	8	F08	0
SG22	135	83	TWD	8	F07	0.18