

**ATTACHMENT (1)**

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**CALVERT CLIFFS UNIT 1, SPRING 2012 –  
180 DAY STEAM GENERATOR REPORT**

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## **AREVA NP Inc.**

### **ENGINEERING INFORMATION RECORD**

**Document No.:** 51 - 9178625 - 000

**Calvert Cliffs Unit 1 – U1R21 180-Day Report**



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Calvert Cliffs Unit 1 – U1R21 180-Day Report

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## Calvert Cliffs Unit 1 – U1R21 180-Day Report

## Record of Revision

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Calvert Cliffs Unit 1 – U1R21 180-Day Report

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**Table of Contents**

	<b>Page</b>
SIGNATURE BLOCK.....	2
RECORD OF REVISION .....	3
LIST OF TABLES .....	5
LIST OF FIGURES .....	6
1.0 180-DAY REPORT.....	7
2.0 REFERENCES.....	20
APPENDIX A : SG11 FBW INDICATIONS .....	21
APPENDIX B : SG12 FBW INDICATIONS .....	26



Calvert Cliffs Unit 1 – U1R21 180-Day Report

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**List of Tables**

**Page**

TABLE 1 – NDE TECHNIQUES UTILIZED FOR IDENTIFIED DEGRADATION .....	9
TABLE 2 – LATTICE SUPPORT WEAR.....	11
TABLE 3 – FOREIGN OBJECT WEAR .....	15
TABLE 4 – LIST OF TUBES PLUGGED DURING U1R21 .....	16
TABLE 5 – TUBE PLUGGING SUMMARY.....	16



Calvert Cliffs Unit 1 – U1R21 180-Day Report

---

**List of Figures**

**Page**

FIGURE 1 – FAN BAR WEAR THROUGHWALL DEPTH DISTRIBUTION .....	12
FIGURE 2 – SG11 FAN BAR WEAR LOCATIONS .....	13
FIGURE 3 – SG12 FAN BAR WEAR LOCATIONS .....	13
FIGURE 4 – SG11 FAN BAR WEAR CONDITION MONITORING .....	18
FIGURE 5 – SG12 FAN BAR WEAR CONDITION MONITORING .....	18
FIGURE 6 – SG11 AND 12 LATTICE SUPPORT WEAR CONDITION MONITORING .....	19
FIGURE 7 – SG11 AND SG12 LOOSE PART WEAR CONDITION MONITORING .....	19

Calvert Cliffs Unit 1 – U1R21 180-Day Report

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**1.0 180-DAY REPORT****Calvert Cliffs Nuclear Power Plant Unit 1  
U1R21 Spring 2012 Steam Generator Inspection**

During the Calvert Cliffs Nuclear Power Plant Unit 1 (CCNPP1) spring 2012 refueling outage (designated as U1R21), both of the steam generators (i.e., SG11 and SG12) were inspected in accordance with CCNPP Technical Specification (TS) 5.5.9, Reference 6. This was the third in-service inspection of the replacement steam generators (SGs), and the SGs had been operated for 9.104 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 Reference 6. **Bold** wording restates the TS requirement, followed immediately by the required CCNPP1 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 April 6, 2012; therefore, based on this date, this report is required to be submitted by October 3, 2012.

**The report shall include:****a. The scope of inspections performed on each SG**

- Eddy Current Bobbin probe examinations (both SGs):
  - 100% of all in-service 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 X-probe (Array) examinations (both SGs):
  - 100% of all in-service tubes, tube end to 1<sup>st</sup> lattice-support (both H/L and C/L).
  - Since 100% of the in-service tubes were examined with X-probe from TTS-3" to 1<sup>st</sup> lattice support on both H/L and C/L sides, these examinations satisfy the requirement to bound (one tube deep) all indications of foreign objects and volumetric degradation that could have been caused by the foreign object- provided the location of interest (elevation) was captured by the X-probe examination range. Some of the noteworthy objects that have been previously detected include flexatalic gasket, wire-like mesh and wire.



## Calvert Cliffs Unit 1 – U1R21 180-Day Report

- 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 +PT probe examinations (RPC) (both SGs):
  - Pre-planned: Inspection of all in-service tube locations containing previously identified foreign object wear. This included 1 tube in SG11 (reported for the first time during U1R18) and, 1 tube in SG12 (reported for the first time during U1R18).
  - Special interest examinations:
    - All bobbin probe and/or Array probe I-Codes.
    - Six previous foreign-object related tube locations flagged for examination.
    - 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.
    - All foreign object locations identified by secondary side visual inspection.
- 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 (Reference 5). This included 1 mechanical plug.
- The following secondary side inspections were performed (both SGs):

### Pre-upper Bundle Flush (UBF) TTS Visual Inspections:

- Visual inspection of the no-tube lane and staywell region, and retrieval of foreign objects with the potential to cause tube damage, if identified
- Three inner bundle inspection passes in each leg from the no-tube lane
- One inner bundle inspection pass from the hot leg handhole to access the kidney region
- During inner bundle inspections an attempt will be made to retrieve collar and/or scale samples for chemical analysis

### UBF and TTS Water Lancing

### Post Lancing TTS Visual Inspections:

- Visual examination of the annulus, no tube lane, and staywell regions
- Three inner bundle inspection passes in each leg from the no-tube lane. The same three inner bundle passes that were performed during the pre UBF TTS visual inspections. This pre and post inspection was performed to assess the effectiveness of the waterlancing evolution.
- Exam includes views into the tube bundle 3 to 5 tubes deep
- Exam includes views upward to the 1<sup>st</sup> lattice support
- Retrieve foreign objects as possible and necessary with concurrence of cognizant Constellation representative



## Calvert Cliffs Unit 1 – U1R21 180-Day Report

## Upper Internals Visual Inspections:

- Secondary separator area including steam nozzle venturis, secondary deck seal skirt, secondary deck structures, and secondary separator top surfaces
- Secondary separator ID including outlet ports, vent holes, skimmer vanes, inlet vanes, and drain tubes
- Primary separator ID including upper can vent holes and rim, flow arms, and riser pipe ID to primary deck attachment
- Primary separator OD including drain tube attachments and riser tube OD to deck joint area
- Primary deck structures including ladders and supports, primary deck surfaces, manway cover and fasteners, aux feedwater header, main feedwater gooseneck piping, and deck to shell attachment
- Lower steam drum and top of tube bundle region including tube bundle support structures (i.e., fan bars, top lattice rim and lattice bar ends, fan bar restraints), tube surfaces, J-tabs, tube to J-tab contacts
- Feedwater annulus region including primary deck to shell attachments, feeding support brackets, shroud pins, shroud slip joint, downcomer entrance, gooseneck attachment point, header pipe, J-tubes, J-tube header welds, and J-tube ID

**b. Active degradation mechanisms found**

Three degradation mechanisms were identified during this examination: 1) fan bar wear, 2) lattice grid support wear and 3) foreign object wear. No evidence of corrosion degradation processes, or cracking 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)
Lattice supp wear	Bobbin	96004.1 (Rev. 13)
	+Point™	96910.1 (Rev. 10)
Foreign Object Wear*	+Point™	27901.1 (Rev. 0) ** (circ groove)





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Calvert Cliffs Unit 1 – U1R21 180-Day Report

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- \* 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 and confirming foreign objects.
- \*\* 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 U1R21 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, 465 fan bar wear (FBW) indications in 378 tubes were identified in the CCNPP1 steam generators during the U1R21 inspection. Although none of the reported indications exceeded the Technical Specification plugging limit of 40%TW, the largest FBW indication (33% in SG12, R53 C105) was preventatively stabilized with a 570-inch length stabilizer, and the tube was plugged.

143 of the 465 indications were newly reported during U1R21. This represents an increase of about 44% since the last in-service inspection in 2008 (U1R18). The maximum depth reported was a 33%TW indication in SG12. This also was a newly reported indication and the tube was removed from service. 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, SG12 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 from both U1R18 (2008) and U1R21. 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.

**Lattice support wear (LSW)** is a mechanical degradation process which produces volumetric tube wear at the interface between the lattice support grids and the tubes. In total, four LSW indications in four tubes were identified in the CCNPP1 steam generators during the U1R21 inspection. Only 1 of the 4 were newly reported during U1R21. The previously reported indications showed little to no growth. Table 2 provides a summary of the LSW indications.



## Calvert Cliffs Unit 1 – U1R21 180-Day Report

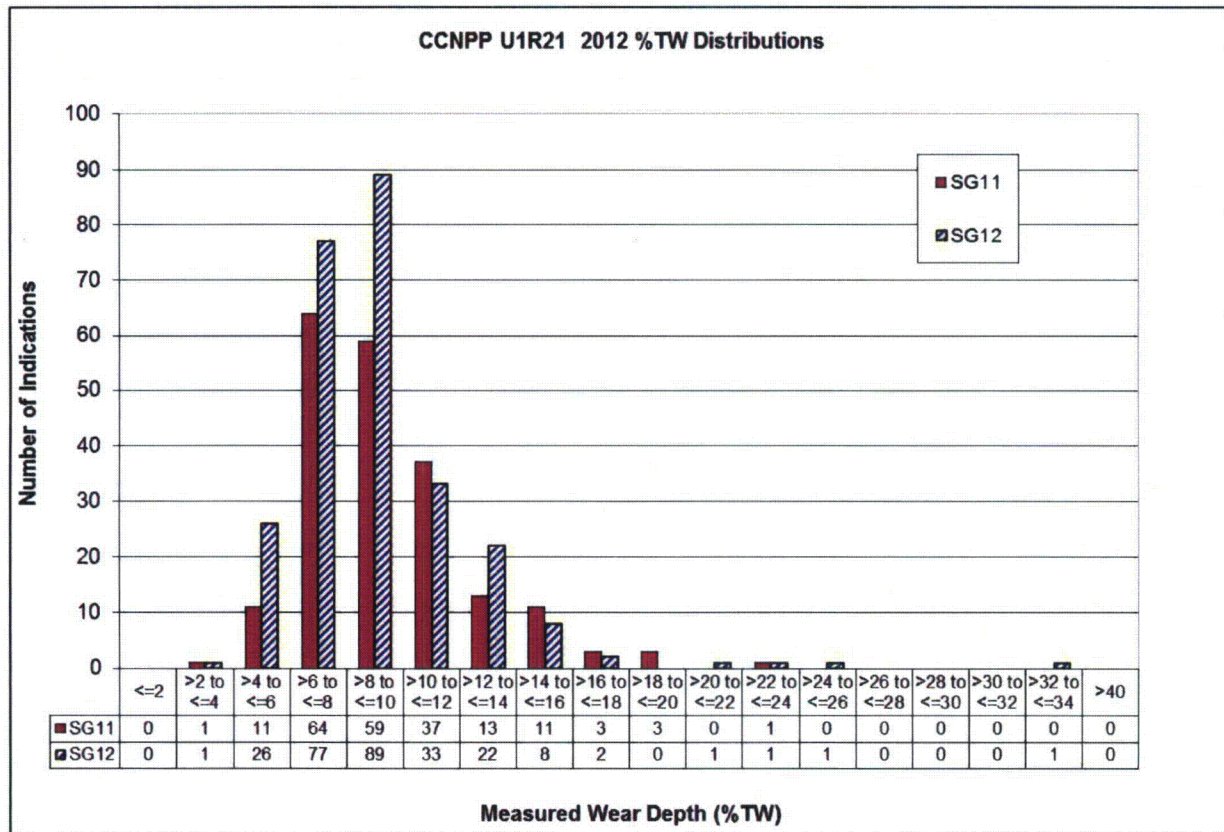
**Table 2 – Lattice Support Wear**

SG	Row	Col	Ind	2008 Depth (%TW)	2012 Depth (%TW)	Location	Eddy Current Techniques	Measured Length (in.) Axial x Circ	Loose Part Detected
11	78	94	WAR	11	12	04H+0.54"	96910.1/ 96004.1	0.26 x 0.30	No
12	18	152	WAR	----	7	03H-1.83"	96910.1/ 96004.1	0.27 x 0.35	No
12	122	86	WAR	9	11	07C+1.16"	96910.1/ 96004.1	0.11 x 0.25	No
12	134	88	WAR	14	12	02H-1.46"	96910.1/ 96004.1	0.32 x 0.35	No



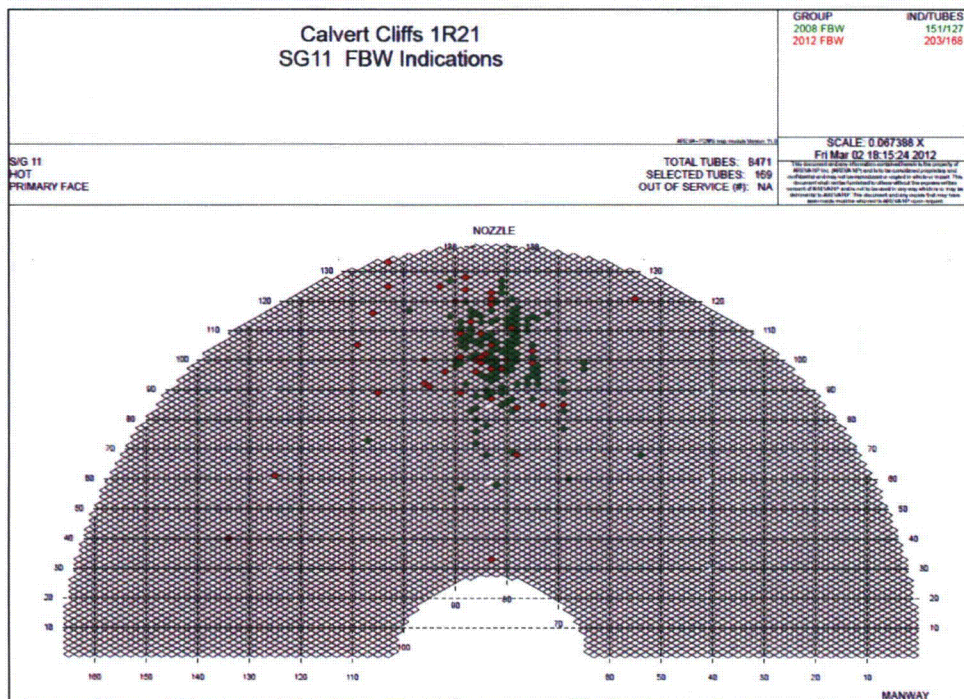
Calvert Cliffs Unit 1 – U1R21 180-Day Report

**Figure 1 – Fan Bar Wear Throughwall Depth Distribution**

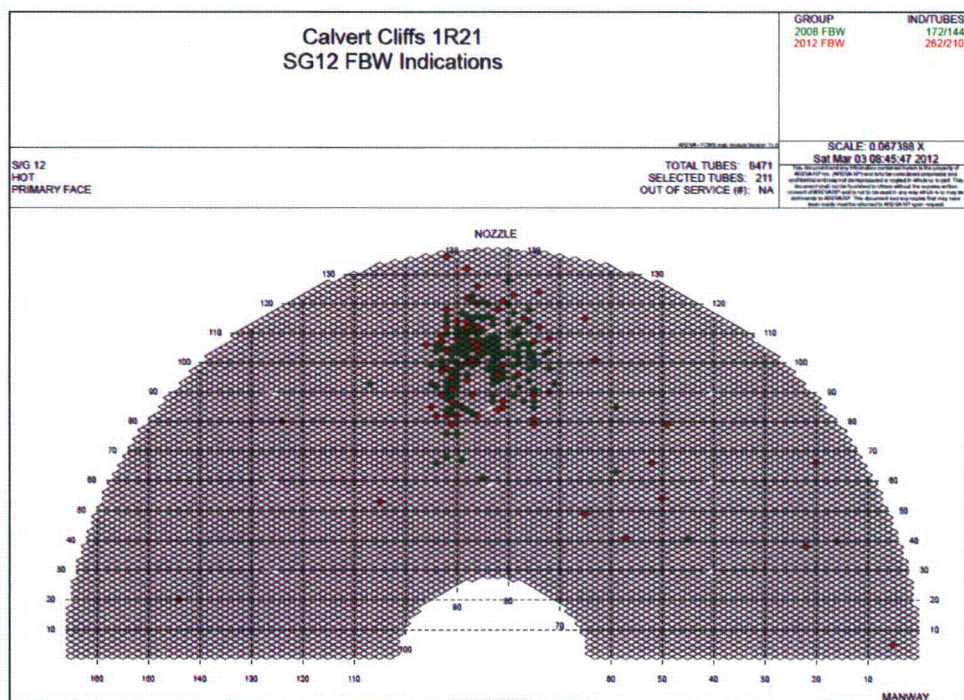


Calvert Cliffs Unit 1 – U1R21 180-Day Report

**Figure 2 – SG11 Fan Bar Wear Locations**



**Figure 3 – SG12 Fan Bar Wear Locations**







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Calvert Cliffs Unit 1 – U1R21 180-Day Report

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During the U1R21 inspection, 7 indications of foreign object wear were detected in 7 tubes within the two SGs (see Table ). These indications were reported as LPW (Loose Part Wear) in the eddy current database. One indication was newly-detected in SG11 and four were newly-detected in SG 12 during U1R21. The remaining (one) indication in SG11, and (one) indication in SG12, were identified during prior inspections, and were pre-planned for re-inspection during U1R21. All LPW indications were sized below the site plugging limit. None of the foreign objects that caused the newly-detected LPW in 2012 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 7 tubes were returned to service.

Due to the previous foreign objects experience at CCNPP, a concerted effort was undertaken during U1R21 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, 108 Potential Loose Part (PLP) indications were reported in SG11, and 259 were recorded in SG12. It should be noted that these quantities represent the initial number of PLP indications in the ECT database. Each of these locations received a +PT examination and most were resolved as NDF. The number of +PT confirmed PLP indications were 17 in SG11 and 7 in SG12.

Upon visually inspecting a location, the indication code was subsequently changed to LPS (Loose Parts Signal) if no loose part was found by visual inspection, LPR (Loose Part Removed) if any object (including a sludge rock) was found and removed from the SG, or VLP (Visual Loose Part) if any object was visually confirmed to be present but not removed from the SG. Thus the stated quantities are actually the sum of PLP, LPS, LPR, and VLP 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 (2008) 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 17 confirmed PLP indications detected in SG11, 8 of them were classified as IBS indications. Accordingly, of the 7 confirmed PLP indications detected in SG12, 1 of them was classified as an IBS indication. Several metallic objects were removed and a few small foreign objects were left in SG11 (see CR2012-1619) and SG12 (see CR2012-1622) secondary side. In total 16 objects are removed from the Unit 1 SGs during 1R21 (12 in SG11 and 4 in SG12).



## Calvert Cliffs Unit 1 – U1R21 180-Day Report

Table 3 – Foreign Object Wear

SG	Row	Col	Ind	2008 Depth (%TW)	2012 Depth (%TW)	Location	Eddy Current Technique	Measured Length (in.) Axial x Circ	Loose Part Detected
11	113	113	LPW	--	25	TSH+0.51"	27901.1	0.29 x 0.33	Yes
11	126	114	LPW	20	19	TSH+0.99"	27901.1	0.21 x 0.25	No
12	22	70	LPW	--	23	TSC+0.20"	27901.1	0.24 x 0.28	No
12	106	134	LPW	24	25	TSH+7.26"	27901.1	0.27 x 0.33	No
12	116	44	LPW	--	24	TSC+0.40"	27901.1	0.24 x 0.33	No
12	117	45	LPW	--	21	TSC+0.30"	27901.1	0.21 x 0.33	No
12	136	86	LPW	--	26	TSC+8.64"	27901.1	0.27 x 0.35	Yes






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 Calvert Cliffs Unit 1 – U1R21 180-Day Report
 

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

One tube in SG12 was plugged during U1R21 (see Table ). This tube was preventatively stabilized and plugged due to Fan Bar wear. The tubes are labeled as TBP (To Be Plugged) in the ECT database. No tubes were plugged in SG11 during the 2012 refueling outage.

**Table 4 – List of Tubes Plugged During U1R21**

SG	Row	Col	Hot Leg	Cold Leg	Reason for Tube Repair
SG12	53	105	ROLLED	ROLLSTAB	TWD@F07-0.94

TBP = Preventative Tube Plug

ROLLSTAB=Stabilizer and Rolled Plug

**f. Total number and percentage of tubes plugged to date**

Table provides the post-U1R21 tube plugging status of the CCNPP1 SGs. There are currently 1 tube plugged in SG11 and 1 tube plugged in SG12.

**Table 5 – Tube Plugging Summary**

SG	Tubes Installed	Tubes Plugged To-Date
SG11	8,471	1 (0.01%)
SG12	8,471	1 (0.01%)
Total	16,942	2 (0.01%)



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Calvert Cliffs Unit 1 – U1R21 180-Day Report

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**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 7. 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 U1R21 FBW depths at a bounding 1.8 inch length for SGs 11 and 12 respectively. Also presented in each figure are the seven 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.

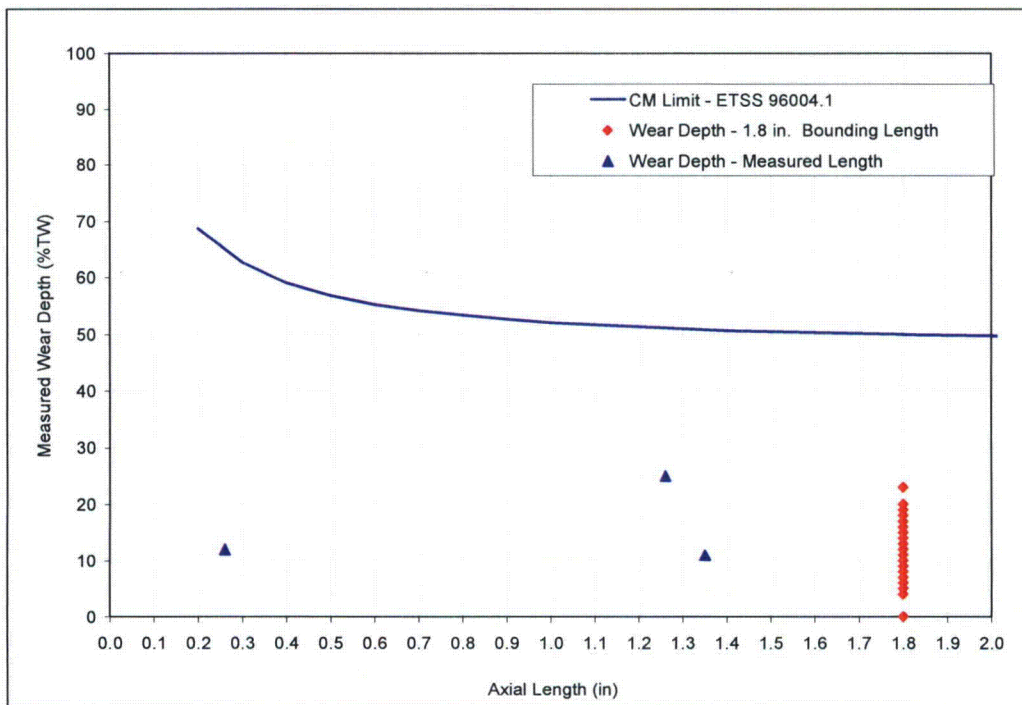
For volumetric indications, meeting the structural performance criteria also provides reasonable assurance that the accident leakage performance criteria would be satisfied at the steam line break pressure differential which is less challenging than the pressure differential required to demonstrate compliance 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 2012 inspection and the condition monitoring assessment confirm that the 2008 operational assessment was appropriately bounding.

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

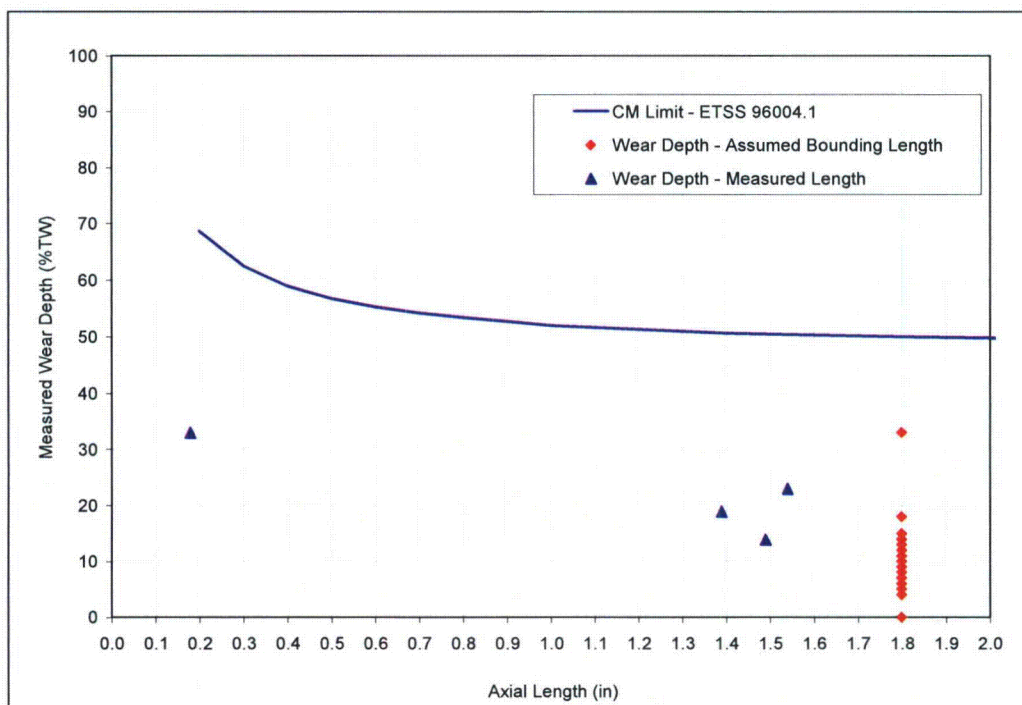
There are no sleeves installed in the CCNPP1 steam generators, therefore the effective plugging percentage is the same as stated in (f) above.

Calvert Cliffs Unit 1 – U1R21 180-Day Report

**Figure 4 – SG11 Fan Bar Wear Condition Monitoring**



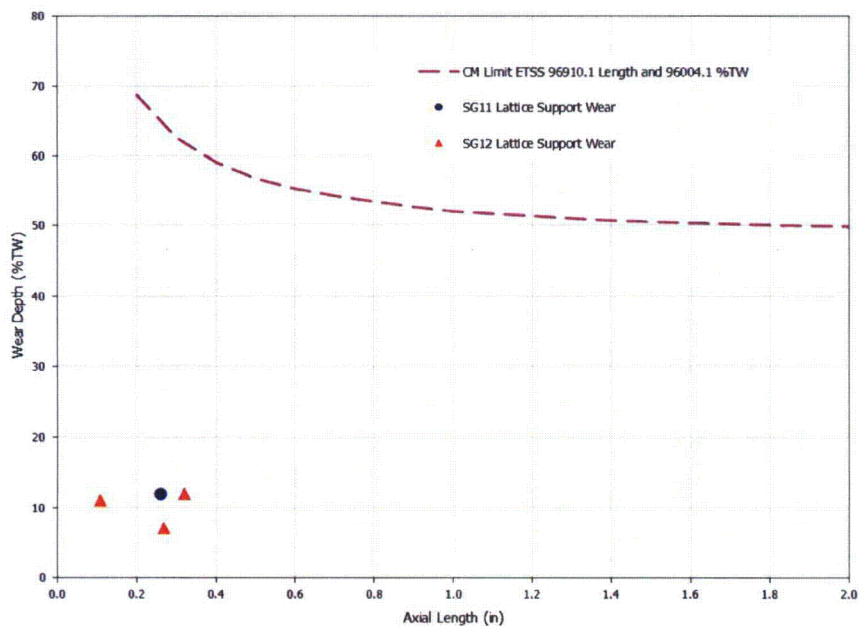
**Figure 5 – SG12 Fan Bar Wear Condition Monitoring**



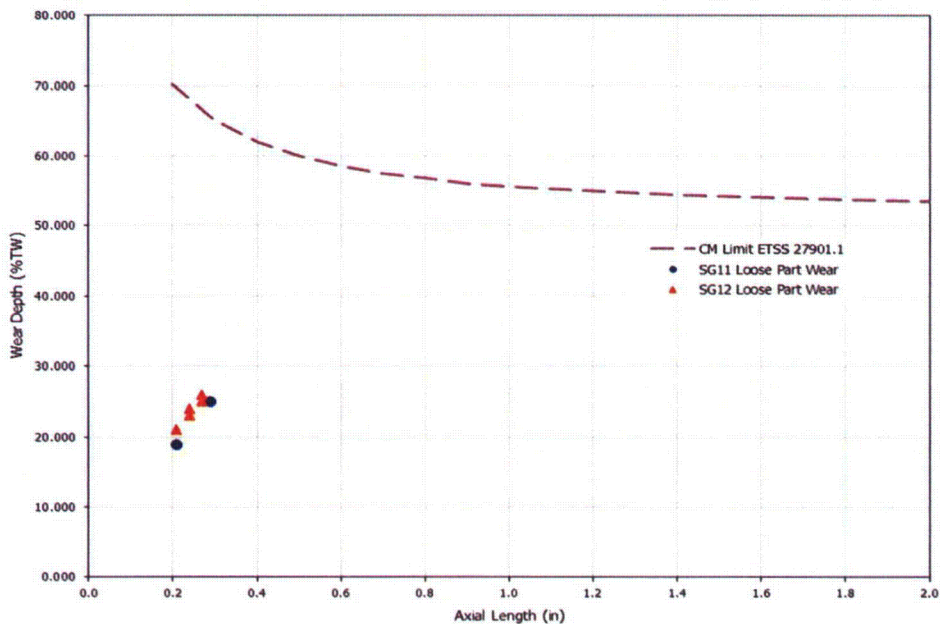


Calvert Cliffs Unit 1 – U1R21 180-Day Report

**Figure 6 – SG11 and 12 Lattice Support Wear Condition Monitoring**



**Figure 7 – SG11 and SG12 Loose Part Wear Condition Monitoring**







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Calvert Cliffs Unit 1 – U1R21 180-Day Report

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## 2.0 REFERENCES

1. AREVA Condition Report 2012-1619: Disposition of Loose Parts in 11 SG, CCNPP Unit 1
2. AREVA Condition Report 2012-1622: Disposition of Loose Parts in 12 SG, CCNPP Unit 1
3. AREVA Document 51-9178583-000, "Calvert Cliffs Nuclear Power Plant Unit 1, Steam Generator Condition Monitoring and Operational Assessment, Spring 2012 / EOC20", March 2012
4. AREVA Document 51-9174684-001, "Calvert Cliffs Nuclear Power Plant Unit 1, Steam Generator Degradation Assessment, Spring 2012 / EOC20," February 2012
5. EPRI Guideline, "Steam Generator Management Program: Pressurized Water Reactor Steam Generator Examination Guidelines: Revision 7", 1013706, October 2007
6. CCNP Technical Specification 5.5.9.b.2 (See Note 1)

### Notes:

1. This reference is not available from the AREVA NP records center; however, it is available from the Constellation Energy Group (CENG) document control system. Therefore, this is an acceptable reference for use on this contract per AREVA NP Procedure 0402-01, Attachment 8 as authorized by the PM signature on page 2.

## Calvert Cliffs Unit 1 – U1R21 180-Day Report

**APPENDIX A: SG11 FBW INDICATIONS**

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
11	117	79	TWD	F06 -0.67	0.47	131	P3	23
11	105	89	TWD	F07 +0.76	0.36	135	P3	20
11	107	83	TWD	F07 -0.54	0.37	122	P3	20
11	120	82	TWD	F06 +1.74	0.34	113	P3	19
11	104	82	TWD	F07 +0.89	0.32	137	P3	18
11	105	79	TWD	F07 +1.89	0.32	130	P3	18
11	95	75	TWD	F07 +1.93	0.28	89	P3	17
11	101	83	TWD	F07 -0.48	0.26	112	P3	16
11	112	78	TWD	F07 +0.87	0.27	126	P3	16
11	113	79	TWD	F06 -0.74	0.28	130	P3	16
11	40	134	TWD	F07 +0.98	0.25	120	P3	15
11	61	125	TWD	F07 +1.93	0.25	111	P3	15
11	88	86	TWD	F07 +1.72	0.24	136	P3	15
11	91	81	TWD	F07 -1.30	0.25	118	P3	15
11	98	74	TWD	F07 +0.86	0.24	100	P3	15
11	103	79	TWD	F07 +1.95	0.24	115	P3	15
11	104	80	TWD	F07 +0.89	0.24	123	P3	15
11	114	78	TWD	F07 +0.87	0.24	117	P3	15
11	102	86	TWD	F07 +1.77	0.21	104	P3	14
11	106	86	TWD	F07 +1.77	0.23	129	P3	14
11	114	82	TWD	F07 +0.95	0.22	104	P3	14
11	117	79	TWD	F07 +1.96	0.23	132	P3	14
11	57	89	TWD	F08 +1.54	0.21	115	P3	13
11	90	84	TWD	F10 -0.73	0.2	114	P3	13
11	92	78	TWD	F07 +0.89	0.2	134	P3	13
11	100	78	TWD	F06 -1.76	0.21	113	P3	13
11	101	75	TWD	F07 +1.91	0.19	130	P3	13
11	101	79	TWD	F06 -0.69	0.19	92	P3	13
11	110	78	TWD	F06 -1.69	0.21	129	P3	13
11	111	79	TWD	F09 +1.32	0.2	110	P3	13
11	111	87	TWD	F07 +0.67	0.2	119	P3	13
11	58	82	TWD	F07 +1.80	0.19	113	P3	12
11	87	75	TWD	F07 +1.93	0.17	105	P3	12
11	95	83	TWD	F07 -0.50	0.19	113	P3	12
11	99	75	TWD	F07 +1.80	0.19	76	P3	12
11	100	90	TWD	F07 +1.73	0.17	124	P3	12
11	101	87	TWD	F06 -1.71	0.19	138	P3	12
11	105	85	TWD	F07 +0.69	0.17	105	P3	12
11	106	78	TWD	F07 +0.89	0.19	115	P3	12





## Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
11	107	79	TWD	F07 -1.78	0.17	114	P3	12
11	107	87	TWD	F06 -1.65	0.18	97	P3	12
11	109	87	TWD	F06 +1.52	0.18	131	P3	12
11	113	83	TWD	F07 -0.43	0.18	111	P3	12
11	116	86	TWD	F07 +1.74	0.19	152	P3	12
11	117	87	TWD	F07 +0.65	0.19	139	P3	12
11	68	84	TWD	F06 -0.65	0.17	136	P3	11
11	69	79	TWD	F07 -0.80	0.16	101	P3	11
11	72	86	TWD	F07 +1.34	0.16	130	P3	11
11	76	86	TWD	F07 +1.80	0.17	94	P3	11
11	83	87	TWD	F07 +1.34	0.17	117	P3	11
11	87	79	TWD	F07 +1.95	0.16	100	P3	11
11	96	80	TWD	F06 -1.73	0.16	131	P3	11
11	98	82	TWD	F08 +2.03	0.17	106	P3	11
11	99	79	TWD	F07 +1.88	0.16	110	P3	11
11	99	89	TWD	F07 +0.78	0.17	126	P3	11
11	101	79	TWD	F07 +1.91	0.16	98	P3	11
11	103	75	TWD	F07 +1.91	0.16	94	P3	11
11	103	79	TWD	F06 -0.72	0.16	59	P3	11
11	104	88	TWD	F06 -0.88	0.17	123	P3	11
11	106	82	TWD	F07 +0.89	0.16	117	P3	11
11	107	89	TWD	F07 +0.65	0.17	136	P3	11
11	109	83	TWD	F08 -0.52	0.16	100	P3	11
11	109	83	TWD	F07 +0.54	0.17	123	P3	11
11	112	80	TWD	F06 +1.89	0.17	134	P3	11
11	113	87	TWD	F07 +0.65	0.17	155	P3	11
11	115	87	TWD	F07 +0.72	0.17	117	P3	11
11	116	86	TWD	F06 -0.78	0.16	121	P3	11
11	121	55	TWD	F07 +0.65	0.16	77	P3	11
11	83	79	TWD	F07 +1.95	0.14	69	P3	10
11	84	86	TWD	F07 -1.86	0.15	148	P3	10
11	92	74	TWD	F07 +0.78	0.14	146	P3	10
11	92	96	TWD	F06 +0.75	0.15	118	P3	10
11	93	83	TWD	F07 -0.43	0.15	114	P3	10
11	94	82	TWD	F07 +0.91	0.15	83	P3	10
11	96	82	TWD	F07 +0.89	0.14	141	P3	10
11	97	65	TWD	F07 +0.74	0.14	59	P3	10
11	97	75	TWD	F07 +1.84	0.15	106	P3	10
11	98	90	TWD	F07 +1.70	0.14	113	P3	10
11	99	83	TWD	F06 +0.80	0.14	95	P3	10
11	101	87	TWD	F07 +0.69	0.15	138	P3	10
11	103	83	TWD	F06 +0.63	0.15	94	P3	10
11	106	80	TWD	F08 -0.80	0.14	75	P3	10





## Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
11	106	88	TWD	F08 -0.83	0.15	136	P3	10
11	107	85	TWD	F07 +0.74	0.15	67	P3	10
11	110	76	TWD	F07 +0.87	0.14	117	P3	10
11	110	78	TWD	F07 +0.89	0.14	115	P3	10
11	113	89	TWD	F07 +0.74	0.15	152	P3	10
11	114	76	TWD	F07 +0.87	0.14	97	P3	10
11	115	87	TWD	F06 -1.70	0.14	135	P3	10
11	116	72	TWD	F06 +1.77	0.14	116	P3	10
11	118	78	TWD	F06 -1.71	0.14	105	P3	10
11	121	83	TWD	F06 +0.43	0.14	90	P3	10
11	127	81	TWD	F06 -1.34	0.14	117	P3	10
11	80	86	TWD	F07 +1.78	0.14	123	P3	9
11	85	69	TWD	F07 +1.87	0.13	103	P3	9
11	87	83	TWD	F05 +0.57	0.13	88	P3	9
11	89	81	TWD	F07 +1.93	0.12	121	P3	9
11	89	83	TWD	F06 +0.55	0.13	93	P3	9
11	89	105	TWD	F03 -0.09	0.13	100	P3	9
11	92	78	TWD	F06 -1.74	0.13	118	P3	9
11	92	78	TWD	F08 +1.98	0.13	131	P3	9
11	92	88	TWD	F08 -1.89	0.12	141	P3	9
11	93	69	TWD	F08 +0.82	0.13	112	P3	9
11	94	74	TWD	F07 +0.84	0.13	105	P3	9
11	94	76	TWD	F07 +0.89	0.13	100	P3	9
11	96	92	TWD	F06 -1.15	0.12	95	P3	9
11	97	81	TWD	F07 -0.78	0.12	114	P3	9
11	98	80	TWD	F07 +0.89	0.13	122	P3	9
11	100	80	TWD	F08 +0.91	0.13	131	P3	9
11	104	82	TWD	F06 -1.64	0.14	132	P3	9
11	105	75	TWD	F07 +1.78	0.13	136	P3	9
11	106	80	TWD	F07 +0.87	0.13	77	P3	9
11	108	84	TWD	F07 +1.91	0.13	126	P3	9
11	108	88	TWD	F06 -0.85	0.13	112	P3	9
11	109	83	TWD	F06 +0.56	0.14	125	P3	9
11	109	85	TWD	F06 +0.71	0.12	162	P3	9
11	109	89	TWD	F07 +0.67	0.13	139	P3	9
11	112	76	TWD	F07 +0.96	0.13	143	P3	9
11	113	85	TWD	F07 +0.76	0.12	158	P3	9
11	114	80	TWD	F07 +0.91	0.13	143	P3	9
11	116	78	TWD	F07 +0.91	0.13	121	P3	9
11	119	83	TWD	F07 -0.41	0.12	101	P3	9
11	120	88	TWD	F07 +1.58	0.12	139	P3	9
11	120	88	TWD	F06 -0.85	0.12	136	P3	9
11	120	90	TWD	F06 +1.76	0.13	128	P3	9





## Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
11	125	93	TWD	F07 +1.98	0.13	122	P3	9
11	127	91	TWD	F09 +1.77	0.13	132	P3	9
11	60	68	TWD	F07 +0.93	0.11	150	P3	8
11	68	54	TWD	F07 -1.06	0.12	123	P3	8
11	68	78	TWD	F06 -1.45	0.12	109	P3	8
11	78	84	TWD	F08 +0.95	0.11	119	P3	8
11	85	73	TWD	F07 -1.79	0.12	121	P3	8
11	85	81	TWD	F06 -0.70	0.11	97	P3	8
11	86	80	TWD	F09 +0.91	0.11	142	P3	8
11	87	79	TWD	F08 +0.84	0.11	135	P3	8
11	88	84	TWD	F08 +1.09	0.11	108	P3	8
11	89	69	TWD	F07 +1.91	0.11	114	P3	8
11	89	89	TWD	F07 +0.82	0.11	142	P3	8
11	91	95	TWD	F07 -0.94	0.1	90	P3	8
11	96	80	TWD	F06 -0.76	0.12	143	P3	8
11	96	86	TWD	F07 -1.08	0.12	109	P3	8
11	98	82	TWD	F07 +1.02	0.12	84	P3	8
11	99	85	TWD	F06 +1.78	0.11	70	P3	8
11	100	82	TWD	F06 +0.78	0.11	141	P3	8
11	100	96	TWD	F11 -0.89	0.11	81	P3	8
11	101	89	TWD	F07 +0.69	0.1	130	P3	8
11	102	78	TWD	F06 -1.67	0.12	96	P3	8
11	102	80	TWD	F08 +0.89	0.11	75	P3	8
11	106	78	TWD	F06 -1.73	0.11	146	P3	8
11	108	84	TWD	F06 -0.87	0.11	149	P3	8
11	109	79	TWD	F06 -0.74	0.12	104	P3	8
11	111	89	TWD	F07 +0.72	0.12	127	P3	8
11	114	74	TWD	F06 -1.75	0.12	90	P3	8
11	115	75	TWD	F07 +1.87	0.11	119	P3	8
11	115	79	TWD	F06 -0.67	0.12	109	P3	8
11	115	91	TWD	F07 +0.89	0.11	135	P3	8
11	117	83	TWD	F07 -0.48	0.12	76	P3	8
11	120	82	TWD	F04 +1.06	0.11	137	P3	8
11	121	79	TWD	F07 +1.74	0.12	121	P3	8
11	123	83	TWD	F06 -0.48	0.11	130	P3	8
11	124	88	TWD	F08 +0.54	0.11	124	P3	8
11	127	91	TWD	F06 +0.95	0.11	148	P3	8
11	33	83	TWD	F07 +0.00	0.09	32	P3	7
11	77	69	TWD	F08 +0.82	0.1	94	P3	7
11	83	79	TWD	F08 +0.93	0.1	127	P3	7
11	84	86	TWD	F07 +1.78	0.1	23	P3	7
11	89	69	TWD	F08 +0.74	0.1	94	P3	7
11	92	76	TWD	F07 +0.83	0.09	114	P3	7



## Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
11	94	84	TWD	F08 +0.92	0.1	106	P3	7
11	95	85	TWD	F07 +0.83	0.09	117	P3	7
11	97	79	TWD	F07 +1.98	0.09	119	P3	7
11	97	83	TWD	F07 -0.50	0.1	93	P3	7
11	99	83	TWD	F08 +0.60	0.1	72	P3	7
11	100	84	TWD	F08 +0.89	0.09	73	P3	7
11	100	86	TWD	F08 -0.89	0.1	137	P3	7
11	101	85	TWD	F07 +0.83	0.1	144	P3	7
11	101	87	TWD	F09 -0.82	0.09	137	P3	7
11	102	84	TWD	F06 -0.80	0.1	109	P3	7
11	102	84	TWD	F07 +1.91	0.1	124	P3	7
11	103	81	TWD	F07 -1.86	0.1	97	P3	7
11	103	83	TWD	F07 -0.45	0.1	121	P3	7
11	105	79	TWD	F06 -0.74	0.1	153	P3	7
11	105	83	TWD	F07 -0.37	0.09	104	P3	7
11	105	109	TWD	F09 +0.70	0.1	155	P3	7
11	116	106	TWD	F07 -1.59	0.1	163	P3	7
11	117	99	TWD	F06 +0.80	0.1	97	P3	7
11	118	78	TWD	F07 +0.89	0.1	145	P3	7
11	123	81	TWD	F07 +1.95	0.1	137	P3	7
11	125	103	TWD	F09 +0.59	0.1	108	P3	7
11	128	88	TWD	F06 +1.70	0.09	117	P3	7
11	133	103	TWD	F07 +0.71	0.1	153	P3	7
11	80	86	TWD	F08 +0.83	0.08	128	P3	6
11	83	69	TWD	F08 +0.82	0.09	128	P3	6
11	84	78	TWD	F05 -0.76	0.08	133	P3	6
11	88	84	TWD	F07 +2.05	0.09	51	P3	6
11	96	74	TWD	F07 +0.89	0.09	129	P3	6
11	97	83	TWD	F06 -0.46	0.08	126	P3	6
11	99	85	TWD	F06 +0.74	0.09	72	P3	6
11	100	84	TWD	F07 +2.05	0.08	120	P3	6
11	115	85	TWD	F07 +0.76	0.08	73	P3	6
11	125	81	TWD	F08 +0.85	0.08	133	P3	6
11	108	78	TWD	F08 -1.19	0.06	129	P3	5
11	99	65	TWD	F07 +1.14	0.05	143	P3	4





## Calvert Cliffs Unit 1 – U1R21 180-Day Report

**APPENDIX B: SG12 FBW INDICATIONS**

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
12	53	105	TWD	F07 -0.94	0.92	106	P3	33
12	111	89	TWD	F07 +1.39	0.52	132	P3	25
12	105	89	TWD	F07 +1.30	0.48	125	P3	24
12	110	86	TWD	F06 -1.11	0.4	136	P3	21
12	103	81	TWD	F07 +1.79	0.31	113	P3	18
12	107	83	TWD	F06 +0.48	0.31	121	P3	18
12	107	85	TWD	F07 -1.11	0.26	141	P3	16
12	41	45	TWD	F07 -1.17	0.24	111	P3	15
12	85	59	TWD	F07 +1.29	0.24	113	P3	15
12	92	78	TWD	F07 -1.83	0.25	114	P3	15
12	102	82	TWD	F06 -1.89	0.24	134	P3	15
12	102	88	TWD	F06 +1.31	0.25	135	P3	15
12	105	83	TWD	F06 -0.61	0.25	121	P3	15
12	121	85	TWD	F06 -1.42	0.24	91	P3	15
12	93	71	TWD	F07 -1.86	0.23	122	P3	14
12	103	79	TWD	F06 -0.81	0.21	118	P3	14
12	103	83	TWD	F06 +0.48	0.21	133	P3	14
12	104	84	TWD	F06 +1.22	0.21	123	P3	14
12	104	90	TWD	F07 -1.83	0.23	107	P3	14
12	107	77	TWD	F06 -0.75	0.21	120	P3	14
12	108	82	TWD	F06 -1.86	0.22	121	P3	14
12	79	49	TWD	F06 +1.18	0.2	113	P3	13
12	103	79	TWD	F07 +1.71	0.2	117	P3	13
12	104	78	TWD	F07 +0.87	0.2	128	P3	13
12	105	83	TWD	F07 -0.52	0.19	127	P3	13
12	105	85	TWD	F07 +1.25	0.2	117	P3	13
12	106	82	TWD	F07 +0.74	0.2	112	P3	13
12	108	82	TWD	F07 +0.66	0.2	128	P3	13
12	108	84	TWD	F07 +1.80	0.2	123	P3	13
12	108	88	TWD	F06 -0.69	0.2	118	P3	13
12	109	89	TWD	F07 +0.76	0.2	115	P3	13
12	110	92	TWD	F06 -0.74	0.2	118	P3	13
12	111	85	TWD	F07 +0.87	0.2	125	P3	13
12	111	87	TWD	F07 +0.83	0.2	119	P3	13
12	115	87	TWD	F07 +1.30	0.21	133	P3	13
12	120	80	TWD	F07 -1.80	0.2	129	P3	13
12	93	83	TWD	F06 +0.42	0.19	125	P3	12
12	95	83	TWD	F06 +0.46	0.19	118	P3	12
12	101	83	TWD	F06 +0.53	0.18	130	P3	12
12	103	85	TWD	F07 -1.04	0.18	142	P3	12
12	103	91	TWD	F06 -1.76	0.18	105	P3	12





Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
12	107	83	TWD	F07 -0.68	0.19	132	P3	12
12	108	88	TWD	F07 -1.79	0.17	102	P3	12
12	109	79	TWD	F06 -0.83	0.19	106	P3	12
12	115	85	TWD	F07 +0.80	0.18	86	P3	12
12	116	86	TWD	F06 -0.60	0.19	108	P3	12
12	116	86	TWD	F07 +1.75	0.19	110	P3	12
12	128	80	TWD	F06 -1.40	0.39	131	P5	12
12	132	88	TWD	F06 +1.40	0.39	131	P5	12
12	40	16	TWD	F06 +0.65	0.16	106	P3	11
12	66	52	TWD	F08 -0.95	0.17	123	P3	11
12	82	90	TWD	F07 +1.39	0.17	121	P3	11
12	83	87	TWD	F08 +1.91	0.17	146	P3	11
12	88	92	TWD	F08 +0.89	0.16	109	P3	11
12	89	91	TWD	F06 -1.76	0.17	138	P3	11
12	91	75	TWD	F07 +1.75	0.16	108	P3	11
12	94	76	TWD	F07 +0.70	0.16	128	P3	11
12	94	92	TWD	F07 +1.94	0.17	120	P3	11
12	95	79	TWD	F07 +1.75	0.16	98	P3	11
12	98	90	TWD	F07 -0.96	0.16	97	P3	11
12	99	89	TWD	F07 -0.81	0.17	114	P3	11
12	100	90	TWD	F07 -1.90	0.16	90	P3	11
12	101	93	TWD	F07 +0.91	0.16	86	P3	11
12	103	75	TWD	F07 +1.71	0.16	112	P3	11
12	104	94	TWD	F07 +1.99	0.16	131	P3	11
12	105	87	TWD	F07 +0.74	0.17	114	P3	11
12	110	86	TWD	F07 +1.80	0.17	129	P3	11
12	110	88	TWD	F07 +1.70	0.17	135	P3	11
12	128	80	TWD	F07 -1.27	0.35	136	P5	11
12	41	57	TWD	F07 -0.95	0.15	121	P3	10
12	49	65	TWD	F07 -1.62	0.14	116	P3	10
12	66	20	TWD	F06 -1.10	0.14	124	P3	10
12	67	89	TWD	F07 +1.24	0.14	103	P3	10
12	83	91	TWD	F07 -0.80	0.15	106	P3	10
12	84	92	TWD	F08 +0.80	0.15	128	P3	10
12	86	90	TWD	F07 -1.06	0.15	117	P3	10
12	87	75	TWD	F07 +1.75	0.15	121	P3	10
12	88	92	TWD	F07 +1.98	0.15	79	P3	10
12	89	79	TWD	F08 +0.76	0.14	120	P3	10
12	89	83	TWD	F06 +0.41	0.15	122	P3	10
12	89	91	TWD	F07 +0.91	0.15	119	P3	10
12	92	90	TWD	F07 +1.34	0.29	118	P5	10
12	95	81	TWD	F07 +1.77	0.15	81	P3	10
12	97	81	TWD	F07 +1.68	0.14	135	P3	10





## Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
12	97	83	TWD	F07 +0.48	0.15	137	P3	10
12	98	72	TWD	F06 -1.84	0.14	122	P3	10
12	98	82	TWD	F07 +0.67	0.15	81	P3	10
12	99	83	TWD	F06 -0.61	0.14	147	P3	10
12	99	95	TWD	F06 -1.86	0.15	62	P3	10
12	100	78	TWD	F06 -1.72	0.15	107	P3	10
12	101	75	TWD	F07 +1.57	0.15	106	P3	10
12	102	76	TWD	F06 -1.87	0.15	83	P3	10
12	103	89	TWD	F07 +0.83	0.14	111	P3	10
12	104	80	TWD	F06 -1.79	0.15	134	P3	10
12	104	82	TWD	F06 -1.88	0.15	123	P3	10
12	104	88	TWD	F07 -1.82	0.14	125	P3	10
12	105	91	TWD	F06 -1.76	0.15	97	P3	10
12	106	76	TWD	F07 +0.90	0.15	141	P3	10
12	106	82	TWD	F06 -1.95	0.15	116	P3	10
12	108	84	TWD	F06 +1.21	0.15	148	P3	10
12	109	83	TWD	F06 +0.42	0.15	110	P3	10
12	111	79	TWD	F06 -0.79	0.14	137	P3	10
12	115	65	TWD	F06 +0.61	0.14	157	P3	10
12	116	84	TWD	F07 +1.89	0.14	128	P3	10
12	120	84	TWD	F06 -0.79	0.14	107	P3	10
12	20	144	TWD	F12 +1.86	0.13	132	P3	9
12	38	22	TWD	F07 -0.86	0.13	78	P3	9
12	54	50	TWD	F06 -1.01	0.12	65	P3	9
12	61	85	TWD	F09 -0.94	0.12	131	P3	9
12	66	94	TWD	F07 +0.94	0.13	90	P3	9
12	76	92	TWD	F08 +0.72	0.12	111	P3	9
12	82	86	TWD	F07 +1.89	0.12	99	P3	9
12	82	94	TWD	F07 +2.04	0.12	109	P3	9
12	85	81	TWD	F03 -1.11	0.12	33	P3	9
12	85	89	TWD	F11 +2.41	0.12	93	P3	9
12	85	91	TWD	F05 -0.85	0.13	117	P3	9
12	87	91	TWD	F05 -0.75	0.13	135	P3	9
12	89	91	TWD	F08 +1.93	0.13	127	P3	9
12	91	91	TWD	F07 +0.78	0.12	93	P3	9
12	92	92	TWD	F08 +0.83	0.12	81	P3	9
12	94	90	TWD	F07 -1.08	0.13	100	P3	9
12	96	78	TWD	F06 -1.79	0.12	108	P3	9
12	96	82	TWD	F06 -1.84	0.13	80	P3	9
12	97	91	TWD	F07 +0.87	0.13	118	P3	9
12	97	93	TWD	F07 -0.89	0.12	109	P3	9
12	98	76	TWD	F06 -1.80	0.13	98	P3	9
12	99	75	TWD	F07 +1.75	0.13	119	P3	9





## Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
12	99	79	TWD	F07 +1.54	0.13	126	P3	9
12	99	79	TWD	F06 -0.72	0.13	87	P3	9
12	99	81	TWD	F07 +1.75	0.13	103	P3	9
12	99	89	TWD	F07 +0.91	0.13	115	P3	9
12	100	88	TWD	F07 +1.95	0.13	74	P3	9
12	101	63	TWD	F06 +0.65	0.14	41	P3	9
12	101	91	TWD	F06 -1.67	0.13	98	P3	9
12	101	91	TWD	F07 +0.76	0.13	103	P3	9
12	102	78	TWD	F07 +0.74	0.13	122	P3	9
12	103	91	TWD	F07 +0.87	0.12	125	P3	9
12	104	72	TWD	F06 -1.61	0.14	105	P3	9
12	104	86	TWD	F06 -0.74	0.12	53	P3	9
12	105	85	TWD	F06 -1.75	0.13	82	P3	9
12	105	91	TWD	F07 +0.85	0.12	140	P3	9
12	106	78	TWD	F07 +0.77	0.13	134	P3	9
12	106	88	TWD	F07 -1.07	0.13	122	P3	9
12	106	90	TWD	F07 -1.80	0.12	107	P3	9
12	107	89	TWD	F07 +0.87	0.13	98	P3	9
12	108	90	TWD	F08 +0.86	0.12	87	P3	9
12	110	88	TWD	F06 -0.48	0.13	128	P3	9
12	110	90	TWD	F07 -1.76	0.13	128	P3	9
12	111	79	TWD	F07 +1.86	0.13	114	P3	9
12	112	90	TWD	F05 +1.88	0.13	118	P3	9
12	113	83	TWD	F06 +0.44	0.13	137	P3	9
12	114	80	TWD	F06 -1.84	0.13	100	P3	9
12	114	90	TWD	F09 +1.96	0.13	72	P3	9
12	116	88	TWD	F06 -0.60	0.12	129	P3	9
12	116	92	TWD	F06 +1.79	0.13	136	P3	9
12	117	79	TWD	F07 +1.75	0.14	130	P3	9
12	117	89	TWD	F07 +0.80	0.13	106	P3	9
12	122	88	TWD	F07 +1.94	0.13	115	P3	9
12	80	124	TWD	F07 +1.63	0.11	135	P3	8
12	82	92	TWD	F08 +0.93	0.12	84	P3	8
12	84	88	TWD	F07 -1.84	0.11	80	P3	8
12	84	88	TWD	F08 +0.87	0.11	69	P3	8
12	85	91	TWD	F06 +1.47	0.12	115	P3	8
12	87	83	TWD	F06 +0.46	0.12	93	P3	8
12	89	75	TWD	F07 -1.91	0.11	110	P3	8
12	90	92	TWD	F08 -0.93	0.11	90	P3	8
12	93	91	TWD	F08 +1.93	0.12	128	P3	8
12	94	76	TWD	F06 -1.84	0.11	132	P3	8
12	95	91	TWD	F08 +1.93	0.12	110	P3	8
12	96	78	TWD	F07 +0.76	0.11	77	P3	8





## Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
12	96	88	TWD	F07 +1.99	0.12	115	P3	8
12	97	83	TWD	F06 +0.44	0.12	144	P3	8
12	98	72	TWD	F07 +0.68	0.11	128	P3	8
12	98	82	TWD	F06 -1.89	0.11	77	P3	8
12	99	83	TWD	F07 -0.57	0.11	126	P3	8
12	99	87	TWD	F07 +0.83	0.12	128	P3	8
12	99	89	TWD	F08 -0.78	0.11	103	P3	8
12	99	93	TWD	F07 +0.94	0.11	84	P3	8
12	103	81	TWD	F06 -0.68	0.11	119	P3	8
12	104	76	TWD	F06 -1.86	0.11	132	P3	8
12	105	93	TWD	F07 +1.07	0.11	119	P3	8
12	106	84	TWD	F06 -0.83	0.11	149	P3	8
12	106	94	TWD	F07 +1.98	0.12	118	P3	8
12	107	93	TWD	F07 -0.85	0.11	124	P3	8
12	108	86	TWD	F05 -1.21	0.24	143	P5	8
12	110	78	TWD	F07 +0.79	0.11	75	P3	8
12	112	74	TWD	F04 +1.09	0.12	53	P3	8
12	112	78	TWD	F07 +0.68	0.11	132	P3	8
12	112	88	TWD	F07 -1.84	0.11	131	P3	8
12	114	92	TWD	F06 +1.96	0.12	93	P3	8
12	115	83	TWD	F06 +0.46	0.11	122	P3	8
12	116	84	TWD	F06 -0.81	0.12	74	P3	8
12	121	87	TWD	F07 +0.80	0.11	87	P3	8
12	123	87	TWD	F07 +0.83	0.11	77	P3	8
12	124	74	TWD	F04 -1.42	0.11	48	P3	8
12	132	88	TWD	F05 +1.51	0.23	128	P5	8
12	63	59	TWD	F10 +2.67	0.1	119	P3	7
12	66	94	TWD	F07 +1.82	0.1	135	P3	7
12	68	92	TWD	F08 +0.76	0.09	122	P3	7
12	76	90	TWD	F07 -1.86	0.09	133	P3	7
12	79	75	TWD	F07 +1.71	0.1	118	P3	7
12	81	75	TWD	F08 +0.74	0.1	120	P3	7
12	82	92	TWD	F07 +1.96	0.1	144	P3	7
12	85	75	TWD	F08 +0.81	0.1	68	P3	7
12	87	77	TWD	F07 +1.86	0.1	125	P3	7
12	87	81	TWD	F07 +1.57	0.1	93	P3	7
12	89	93	TWD	F08 -0.76	0.09	68	P3	7
12	93	91	TWD	F07 +0.85	0.09	90	P3	7
12	93	95	TWD	F07 +0.98	0.1	107	P3	7
12	94	88	TWD	F07 +2.00	0.1	144	P3	7
12	94	92	TWD	F08 +0.91	0.1	117	P3	7
12	96	88	TWD	F06 -0.67	0.09	56	P3	7
12	96	90	TWD	F07 -1.92	0.1	49	P3	7





## Calvert Cliffs Unit 1 – U1R21 180-Day Report

SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
12	98	84	TWD	F08 -1.95	0.09	97	P3	7
12	98	92	TWD	F07 -0.35	0.1	93	P3	7
12	99	83	TWD	F08 +0.63	0.1	54	P3	7
12	100	86	TWD	F06 +0.76	0.09	101	P3	7
12	101	87	TWD	F07 -0.74	0.09	54	P3	7
12	101	87	TWD	F07 +0.82	0.09	86	P3	7
12	102	78	TWD	F06 -1.86	0.1	122	P3	7
12	102	86	TWD	F06 -0.70	0.09	112	P3	7
12	103	73	TWD	F07 +1.75	0.09	112	P3	7
12	104	92	TWD	F07 +1.85	0.09	121	P3	7
12	106	96	TWD	F08 -0.74	0.1	111	P3	7
12	107	75	TWD	F07 +1.88	0.09	90	P3	7
12	107	87	TWD	F07 +0.78	0.09	124	P3	7
12	108	72	TWD	F07 +0.61	0.09	122	P3	7
12	108	84	TWD	F06 -0.79	0.09	93	P3	7
12	112	86	TWD	F06 +0.80	0.09	124	P3	7
12	112	92	TWD	F06 +1.87	0.1	74	P3	7
12	115	77	TWD	F06 -0.75	0.09	129	P3	7
12	118	76	TWD	F06 -1.82	0.1	125	P3	7
12	118	82	TWD	F06 -1.80	0.09	97	P3	7
12	118	92	TWD	F06 +1.76	0.1	111	P3	7
12	136	92	TWD	F08 -0.67	0.1	107	P3	7
12	79	91	TWD	F07 +0.72	0.08	153	P3	6
12	85	91	TWD	F07 -0.76	0.08	62	P3	6
12	85	95	TWD	F07 -0.96	0.09	137	P3	6
12	89	87	TWD	F08 +1.91	0.09	82	P3	6
12	90	72	TWD	F06 -1.89	0.08	86	P3	6
12	92	90	TWD	F07 -1.94	0.07	60	P3	6
12	92	92	TWD	F07 +1.89	0.08	128	P3	6
12	94	82	TWD	F06 -1.77	0.09	140	P3	6
12	96	88	TWD	F08 +0.89	0.09	113	P3	6
12	100	90	TWD	F08 -1.83	0.09	94	P3	6
12	100	90	TWD	F05 +1.90	0.09	74	P3	6
12	106	86	TWD	F07 +1.89	0.08	128	P3	6
12	109	93	TWD	F05 -0.70	0.09	90	P3	6
12	113	87	TWD	F07 +0.78	0.09	86	P3	6
12	114	76	TWD	F06 -1.80	0.08	103	P3	6
12	114	88	TWD	F09 -0.76	0.08	115	P3	6
12	120	86	TWD	F08 +0.84	0.08	45	P3	6
12	121	81	TWD	F07 +1.72	0.08	133	P3	6
12	123	79	TWD	F07 +1.71	0.08	57	P3	6
12	126	86	TWD	F07 +1.89	0.08	118	P3	6
12	132	88	TWD	F08 -1.14	0.17	136	P5	6

Calvert Cliffs Unit 1 – U1R21 180-Day Report

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SG	ROW	COL	IND	LOCATION	VOLTS	DEG	CHN	2012%TW
12	84	82	TWD	F05 -0.78	0.07	117	P3	5
12	87	75	TWD	F09 -0.81	0.07	99	P3	5
12	92	94	TWD	F07 +2.10	0.06	122	P3	5
12	106	86	TWD	F06 -0.72	0.07	139	P3	5
12	128	80	TWD	F06 +1.20	0.13	130	P5	5
12	5	5	TWD	F12 -4.27	0.06	61	P3	4