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CALVERT CLIFFS NUCLEAR POWER PLANT DEPARTMENT  
CALVERT CLIFFS NUCLEAR POWER PLANT  
LUSBY, MARYLAND 20657

May 1, 1990

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

Docket No. 50-317  
License No. DPR 53

Dear Sirs:

The attached LER 88-03, Revision 1, is being sent to you as required under 10 CFR 50.73.

Should you have any questions regarding this report, we would be pleased to discuss them with you.

Very truly yours,

R. E. Denton

JV/lr

cc: Thomas T. Martin  
Director, Office of Management Information  
and Program Control  
Messrs: G. C. Creel  
C. H. Cruse  
J. R. Lemons  
L. B. Russell  
R. P. Heibel

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## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Calvert Cliffs, Unit 1

DOCKET NUMBER (2)

0 5 0 0 0 3 1 7 1 OF 0 2

PAGE (3)

TITLE (4)

Incorrect Steam Generator Tube plugged

EVENT DATE (5)			LER NUMBER (6)			K-BOOK DATE (7)			OTHER FACILITIES INVOLVED (8)							
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES		DOCKET NUMBER(S)					
1	2	0	9	8	8	0	0	3	0	1	0	5	0	1	9	0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)									
POWER LEVEL (10)	0 1 0 0	20.402(b)		20.405(c)		60.73(a)(2)(iv)		73.71(b)			
		20.405(a)(1)(i)		60.36(c)(1)		60.73(a)(2)(v)		73.71(c)			
		20.405(a)(1)(ii)		60.36(c)(2)		60.73(a)(2)(vi)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)			
		20.405(a)(1)(iii)	X	60.73(a)(2)(i)		60.73(a)(2)(vii)(A)					
		20.405(a)(1)(iv)		60.73(a)(2)(ii)		60.73(a)(2)(vii)(B)					
20.405(a)(1)(v)		60.73(a)(2)(iii)		60.73(a)(2)(ix)							

LICENSEE CONTACT FOR THIS LER (12)

NAME

J. Volkoff - Compliance Engineer

TELEPHONE NUMBER

AREA CODE

3 0 1 2 6 0 - 1 3 6 4 9

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)		NO		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
		X					

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

During tube plugging on Unit 1 Steam Generator 12 (EHS SB-SG) on December 9, 1986, the plug intended for the outlet end of tube R94 L66 was installed in adjacent tube R93 L67. The error was not discovered until April 23, 1988 during subsequent eddy current examinations. The plug was installed by a contractor, Combustion Engineering, on December 9, 1986 using a robotic manipulator arm equipped with a position indicating system.

The cause of the error was failure to follow procedures. The position indicator failed during plugging operations but work continued by using a video camera and temporary markings on the tube sheet. This method of locating tubes to be plugged was not permitted by the contractor's procedures. A contributing factor to the error was the incorrect placement of a tube sheet mark by Calvert Cliffs personnel.

The correct tube has been plugged and the improperly plugged tube has been evaluated and found acceptable. The contractor will not be used again until corrective actions for this event are reviewed. Actions were taken to prevent the incorrect placement of location marks on the tube sheet during future plugging operations.

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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TEXT (If more space is required, use additional NRC Form 305A's) (17)

**I. DESCRIPTION OF EVENTS**

During tube plugging on Unit 1 Steam Generator 12 (EEIS SB-SG) on December 9, 1986, the plug intended for the outlet end of tube R94 L66 was installed in adjacent tube R93 L67. The error was discovered on April 23, 1988 during subsequent eddy current examinations. Tube R94 L66 had a 44 percent through wall defect when examined in 1986 and was to be plugged in accordance with Technical Specification 4.4.5.4.b. As a result of the plugging error, Steam Generator 12 was operated for a full cycle without the defective tube plugged. At the time the event was discovered, Calvert Cliffs Unit 1 was in Mode 6 (refueling) at a temperature of 88 degrees F and atmospheric pressure.

**II. BACKGROUND**

During the Fall 1986 Refueling Outage, the contractor (Combustion Engineering) was employed to plug steam generator tubes in accordance with the contractor's procedures and Quality Assurance Program and using the contractor's Quality Control (QC) organization. The contractor's procedure for plugging tubes required that tubes be located using either the position indication system on the contractor's Genesis robotic manipulator arm or by installing and using a template. The contractor chose to use the position indication system and a template was not installed.

Prior to the start of work, a list of the location numbers of the tubes to be plugged was given to the contractor. Additionally, BG&E personnel marked the tubes designated to be plugged. The marks on the tubes to be plugged were made in accordance with BG&E's own procedure for plugging tubes and using a ZETEC SM-10 robotic manipulator arm. Marking tubes to be plugged and using these marks to locate tubes to be plugged was not required or mentioned in the contractor's procedure. The marks were intended to allow the contractor to use a video camera to provide independent but informal verification that plugs were being installed in the correct location. The contractor's procedure did require QC verification of each step in the procedure, but provided no detail on how verification was to be performed.

The position indication system on the contractor's Genesis robotic manipulator failed during plugging operations. At the time, BG&E personnel were aware that the contractor was having problems with the system, but did not know that the system had failed. After this failure, the marks on the tubesheet were used as the sole mechanism for locating tubes to be plugged. This technique for locating tubes was not addressed in the contractor's procedure, and the procedure was not changed.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (C-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 360A's) (17)

During eddy-current testing of Unit 1 Steam Generator No. 12 on April 23, 1988, a plug was found in the outlet tube sheet in the tube adjacent to the tube which should have been plugged.

As part of the investigation, BG&E personnel reviewed a copy of the video tape showing the insertion of the mispositioned plug. The picture quality was poor and BG&E personnel concluded that the video showed the plug being inserted into the tube adjacent to the marked tube. This was reported to the NRC in Revision 0 of this LER.

On June 13, 1988, shortly after the LER was issued, the contractor sent a letter to BG&E stating the video tape showed the plug had been installed in the tube marked by BG&E. This contradicted a statement made in the LER. However, the letter also acknowledged that plugging activities had been conducted with an inoperable position indication system.

Upon receipt of the letter from the contractor, BG&E personnel again reviewed the copy of the video tape and concluded that the picture quality was too poor to make a positive determination whether the mark was located correctly. The poor picture quality supported BG&E's contention that the tube plugging should have been terminated when the position indicator failed.

On March 13, 1990, BG&E obtained the original video tape from the contractor. The picture quality of the original tape was sufficient to determine conclusively that the plug was installed in the tube that was marked. This indicates that BG&E had marked the incorrect tube and this was a contributing factor in plugging the wrong tube.

The cause of the error in marking the tube could not be determined but is suspected to be personnel error since review of subsequent eddy current data supports the adequacy of ZETEC SM-10 equipment and calibration.

III. ANALYSIS

Technical Specifications requires that a steam generator tube having an imperfection exceeding 40 percent of the nominal tube thickness must be plugged. This is to prevent the tube from becoming unserviceable prior to the next inspection. Unserviceable is defined as having a leak or a defect large enough to affect a tubes' structural integrity.

Tube R94 L66 contained a 44 percent through wall defect when examined in 1986. An examination conducted after the plugging error showed the defect increased 12 percent through the cycle while only one tube end was plugged. The tube that was plugged inadvertently is still not defective; however, the plug was not removed.

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 400 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 306A's) (17)

A steam generator tube rupture is analyzed in the Final Safety Analysis Report. The event is specifically addressed in operating procedures and in operator training.

The total number of tubes plugged remains below the analyzed limit of 100 tubes.

No similar events have occurred.

**IV. CAUSES**

The cause analysis of plugging the wrong tube identified the following errors:

1. Failure of the position indicator on the contractor's Genesis robotic manipulator arm. (This failure was known to the contractor's personnel prior to the the start of plug installation on the tube that was incorrectly plugged.)
2. Failure of the contractor to recognize that the failure of the position indicator required termination of plugging operation. This is because procedure prerequisites were not satisfied with the position indicator inoperable. Without the position indicator or a template, the contractor's procedure provided no method for locating the tubes to be plugged.
3. Failure to document the loss of the position indicator either in the procedure or on a Field Action Request. This would have resulted in the identification of the failure to follow procedures while operations were still in progress or during the work package closeout.
4. Marking the tubes to be plugged when it was not part of the procedure and then marking the wrong tube.
5. Conducting plugging operations in violation of the procedure by using marks for position indication, a method not authorized by the procedure, instead of installing a template or repairing the manipulator's position indicator.
6. Failure of the contractor's supervision and QC personnel to stop plugging activities or change the procedure when they became aware activities were not being conducted in accordance with the procedure.
7. Lack of detail in the procedure about the method used to locate a tube.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 306A's) (17)

V. CORRECTIVE ACTIONS

The plugging error was identified and the correct tube (R94 L66) was plugged in 1988. The improperly located plug (outlet of tube R93 L67) remains installed. The plug and tube were evaluated and found acceptable.

A Non-Conformance Report (NCR) has been issued to document this event. This NCR stipulates that the contractor involved in this event be identified on the Approved Vendor List (AVL) as not authorized for plugging steam generator tubes until the contractor's program is evaluated and the specific concerns identified are corrected.

BG&E's procedure for plugging tubes, unlike the contractor's procedure, does require marking the tubesheet prior to plugging tubes. Subsequent to the event, changes to BG&E's procedure for plugging tubes added optional checks to verify correct marking of the tubes. An optional check has been used since the event was discovered. The additional check used consists of passing a probe through the tube after both ends are marked to assure both ends of the same tube are marked. The optional checks will be made mandatory before tube plugging is performed again.

IV. ADDITIONAL INFORMATIONA. Previous Similar Event

No similar events have occurred.

B. Affected Component Identification

<u>Component</u>	<u>IEEE 805 System ID</u>	<u>IEEE 803 Component</u>
Steam Generator	AB	SG