



April 25, 2008

U.S. Nuclear Regulatory Commission  
Washington, DC 20555

**ATTENTION:** Document Control Desk

**SUBJECT:** Calvert Cliffs Nuclear Power Plant  
Unit No. 1; Docket No. 50-317; License No. DPR 53  
Licensee Event Report 317/2008-001, Revision 0  
Pressure Boundary Leakage Caused by Primary Water Stress Corrosion Cracking

The attached report is being sent to you as required by 10 CFR 50.73. Should you have questions regarding this report, please contact Mr. Jay S. Gaines at (410) 495-5219.

Very truly yours,

A handwritten signature in black ink, appearing to read "DRB", written over a horizontal line.

Douglas R. Bauder  
Plant General Manager

DRB/SMR/bjd

Attachment: As stated

cc: D. V. Pickett, NRC  
S. J. Collins, NRC

Resident Inspector, NRC  
S. Gray, DNR

FE22  
NRR

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollects@nrc.gov](mailto:infocollects@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

## 1. FACILITY NAME

Calvert Cliffs Nuclear Power Plant, Unit 1

## 2. DOCKET NUMBER

05000 317

## 3. PAGE

1 OF 005

## 4. TITLE

Pressure Boundary Leakage Caused by Primary Water Stress Corrosion Cracking

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED																																					
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9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)																																											
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10. POWER LEVEL																																														
0																																														

## 12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

S. M. Reichard, Engineering Analyst

TELEPHONE NUMBER (Include Area Code)

410-495-3648

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	AB	PZR	C490	Y					

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO

## 15. EXPECTED SUBMISSION DATE

MONTH DAY YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On February 25, 2008, during performance of a bare metal visual examination, dry boric acid was noted on pressurizer heater sleeve C-2 indicating reactor coolant leakage. Subsequent ultrasonic examination confirmed the absence of a circumferential flaw. All other pressurizer heater sleeves were inspected with no additional findings. The most likely cause of the leak is Primary Water Stress Corrosion Cracking. The heater sleeve was repaired by installing an approved mechanical clamp. As a preventive action, the Unit 1 Pressurizer Heater Sleeves will be repaired/replaced in a future refueling outage which eliminates their susceptibility to Primary Water Stress Corrosion Cracking. This preventive action was established due to similar events discussed in Licensee Event Reports 318/89-007 and 317/94-003.

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## I. DESCRIPTION OF EVENT

## A. PRE-EVENT PLANT CONDITIONS

On February 25, 2008, prior to discovery of the subject condition, Unit 1 was in Mode 5 during a scheduled refueling outage. Unit 2 was operating at 100 percent rated thermal power and was not affected by the subject condition.

## B. EVENT

On February 25, 2008, during a scheduled refueling outage, dry boric acid was noted on Unit 1 pressurizer heater sleeve C-2. The leakage was detected during the pressurizer heater sleeve bare metal visual exam which is performed every refueling outage. Subsequent lamb wave ultrasonic examination confirmed the absence of a circumferential flaw. The heater sleeve was repaired by installing an approved mechanical nozzle seal assembly (MNSA) clamp at heater sleeve location C-2 on the Calvert Cliffs Unit 1 pressurizer prior to restart of Unit 1 from the 2008 Refueling Outage.

## C. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED TO THE EVENT

There were no inoperable structures, systems, or components that contributed to the condition.

## D. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES:

February 25, 2008 at 0140: Dry boric acid was detected on pressurizer heater sleeve C-2 when performing bare metal visual exam.

February 25, 2008 at 0200: Entered Technical Requirements Manual (TRM) Technical Normal Condition (TNC) 15.4.3.A for the structural integrity of an ASME Code Class 1 component not within the limit.

February 25, 2008 Day Shift: Bare metal visual exams were completed on all pressurizer heater sleeves. No other occurrences were discovered.

February 26, 2008 at 1633: Lamb wave ultrasonic examination was completed to determine if flaw was circumferential. The lamb wave exam confirmed the absence of a circumferential flaw reflector.

March 2, 2008 Night Shift: Installation of an approved MNSA clamp was completed on pressurizer heat sleeve C-2 under Maintenance Order 1200800084.

March 3, 2008 at 2328: Exited TRM TNC 15.4.3.A because the structural integrity of the ASME Code Class 1 component was restored.

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March 11, 2008: Visual Test-2 leak testing examination was completed satisfactorily.

**E. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED**

No other systems or secondary functions were affected by the subject condition.

**F. METHOD OF DISCOVERY**

On February 25, 2008, during Calvert Cliffs Nuclear Power Plant Unit 1 Refueling Outage, dry boric acid was noted on Unit 1 pressurizer heater sleeve C-2. The leakage was detected during the pressurizer heater sleeve bare metal visual exam which is performed every refueling outage per the Alloy 600 Program Plan and the Boric Acid Corrosion Control Program.

**G. MAJOR OPERATOR ACTION**

Operations entered TRM TNC Contingency Measure 15.4.3.A "Structural integrity of ASME Class 1 component is not within the limit." Operations limited the Reactor Coolant System temperature per the TRM TNC as required to satisfy nil-ductility temperature considerations. The TRM TNC was exited following the completion of Maintenance Order 1200800084.

**H. SAFETY SYSTEM RESPONSES**

There were no safety system responses as the unit was in a refueling outage condition and in Mode 5.

**II. CAUSE OF EVENT:**

The event is NUREG-1022, Revision 2, Cause Code B

The apparent cause of the event as determined by Condition Report IRE-029-507 is Primary Water Stress Corrosion Cracking (PWSCC) of the Alloy 600 type material. The susceptibility of Alloy 600 type material to PWSCC is a well known industry issue. Leaks of this nature have occurred at Calvert Cliffs in the past. The Calvert Cliffs Alloy 600 Program Plan and its references thoroughly document the background, history of issues, susceptibility and safety evaluation of the pressurizer heater sleeves. Extensive non-destructive examination and destructive failure analysis of heater sleeves that leaked in the past have all concluded the failure mechanism to be PWSCC.

**III. ANALYSIS OF THE EVENT:**

The subject condition satisfies the criteria in NUREG-1022, Revision 2, for principal safety barriers of the nuclear power plant being seriously degraded. Therefore, this event is reportable pursuant to 10 CFR 50.73(a)(2)(ii)(A). An immediate event notification report (44006) was also made pursuant to 10 CFR 50.72(b)(3)(ii)(A). Calvert Cliffs Nuclear Power Plant Technical Specification Limiting Condition for Operation (LCO) 3.4.13, Reactor Coolant System Operational Leakage allows no pressure boundary leakage while in Modes 1 through 4. The

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discovery of pressure boundary leakage, although in Mode 5, indicates that the flaw existed in Mode 1 most likely for a period longer than the 6-hour completion time allowed under Condition 3.4.13.B. The failure to recognize and meet the requirements of Technical Specification Condition 3.4.13.B also should have required entry into Technical Specification LCO 3.0.3. Therefore, this condition is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by the plant's Technical Specifications.

This event did not result in any actual nuclear safety consequences. Due to the low probability for significant leakage the annual risk impact due to this condition is less than 1E-06 in core damage frequency and 1E-07 large early release frequency.

## IV. CORRECTIVE ACTIONS:

## A. ACTION TAKEN TO RETURN AFFECTED SYSTEMS TO PRE-EVENT NORMAL STATUS:

An approved MNSA clamp was installed at heater sleeve location C-2 on the Calvert Cliffs Unit 1 pressurizer.

## B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE

## Preventive Actions

Repair/replace the Calvert Cliffs Unit 1 Pressurizer Heater Sleeves by the end of the 2012 refueling outage to eliminate the susceptibility to PWSCC.

## V. ADDITIONAL INFORMATION

## A. FAILED COMPONENTS:

Pressurizer Heater Sleeve C-2

## B. PREVIOUS LERs ON SIMILAR EVENTS

A review of Calvert Cliffs' events over the past several years was performed. Previous LERs on similar events are as follows:

LER 318/89-007, Revisions 0, 1, and 2, Evidence of Leakage from Unit 2 Pressurizer Heater Penetrations due to Intergranular Stress Corrosion Cracking Caused by Residual Fabrication Stress. (Intergranular Stress Corrosion Cracking has been re-termed to PWSCC.)

LER 317/94-003. Pressurizer Heater Sleeve Cracking.

As stated earlier, corrective and preventive actions established as a result of the events discussed in those previous LERs have been incorporated in the Alloy 600 Program Plan. No

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new corrective or preventive actions were required to address the condition described in this LER.

**C. THE ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) COMPONENT  
FUNCTION IDENTIFIER AND SYSTEM NAME OF EACH COMPONENT OR SYSTEM  
REFERRED TO IN THIS LER:**

Component	IEEE 803 EIIS Function	IEEE 805 System ID
Pressurizer	PZR	AB
Heater	EHTR	AB
Pressure/Level Penetration	PEN	AB
Heater Sleeve	SLV	AB

**D. SPECIAL COMMENTS**

None