Calvert Cliffs Nuclear Power Plant

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

CENG℠
a joint venture of
Constellation Energy · EDF

CALVERT CLIFFS
NUCLEAR POWER PLANT

April 15, 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; License No. DPR 69
Licensee Event Report 2011-001
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. Douglas E. Lauver at (410) 495-5219.

Very truly yours,

E. A. Larson

Eric A. Larson
Plant General Manager

EAL/TJU/bjd

Attachment: As stated

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

IE22
NRR

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

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 Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@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.

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Calvert Cliffs Nuclear Power Plant, Unit 2	05000 318	1 OF 05

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	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	17	2011	2011	- 001 -	00	04	15	2011		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

6

10. POWER LEVEL

0

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☒ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
T. J. Unkle, Engineering Analyst	410-495-3698

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 17, 2011, while Unit 2 was in a refueling outage, it was verified that during a bare metal examination of all pressurizer heater locations, dry boric acid was noted on heater N3 outer sleeve to weld pad J-Groove weld location indicating reactor coolant leakage. Based on this visual examination and the results from chemical analysis, the leak most likely existed during plant operation. Additional non-destructive and destructive examinations were performed. This non-destructive and destructive examination concluded that this leak is attributed to primary water stress corrosion cracking in the J-Groove weld. This heater location was repaired by removal of the N3 heater, sleeves, J-Groove weld, and installing an American Society of Mechanical Engineers Code approved welded plug. An additional thirteen pressurizer heater sleeve locations received additional non-destructive examinations and no additional non-conforming indications were found. All pressurizer heater penetrations received a non-destructive visual examination at normal operating pressure and temperature with no further visual signs of leakage. The scope of identified leakage and pressurizer repair was isolated to the pressurizer heater N3 location.

I. DESCRIPTION OF EVENT

A. PRE-EVENT PLANT CONDITIONS

Unit 2 was in Mode 6 refueling when the condition was discovered.

B. EVENT

On February 17, 2011 during a refueling outage, dry boric acid was noted on Unit 2 pressurizer heater N3 outer sleeve to weld pad J-Groove weld. The leakage was detected during the pressurizer heater sleeve bare metal visual exam which is performed every refueling outage. Non-destructive examination (NDE) and destructive examination confirmed weld flaws at the pressurizer heater N3 location. This pressurizer heater penetration was repaired using an American Society of Mechanical Engineers (ASME) Code approved welded plug.

Based on visual examination performed during the boric acid walkdown and chemical analysis of the white crystalline substance, the leak most likely existed for some time during plant operation over the past operating cycle. The NDE at the pressurizer heater N3 location indicated weld flaws with further destructive examination indicating the root cause of leakage to be primary water stress corrosion cracking (PWSCC).

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

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

D. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES

02/17/2011 At approximately 2230, during Mode 6 inservice inspection to satisfy ASME Code Case N-722 detected dry boric acid deposits at the pressurizer heater N3 location.

02/18/2011 At 0300, Event number 46623 immediate (eight hour) notification report submitted pursuant to 10 CFR 50.72(b)(3)(ii)(A) (degraded condition).

02/19/2011 Non-destructive and destructive examination performed to characterize the location, orientation, and length of cracks as required by 10 CFR 50.55a(g)(6)(ii)(E)(2) and determine as-found condition, scope of condition, possible failure mechanism, and engineering determination of best repair method.

03/03/2011 Pressurizer heater penetration N3 repair completed.

E. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED

There were no other systems or secondary functions affected. This event is applicable to Calvert Cliffs Nuclear Power Plant, Unit 2 only.

F. METHOD OF DISCOVERY

Visual examination during the Mode 6 inservice inspection to satisfy ASME Code Case N-722 requirements per 10 CFR 50.55a. The pressure boundary leak was verified by analysis of the deposit.

G. MAJOR OPERATOR ACTION

Operations entered Technical Requirements Manual Technical Normal Conditions Contingency Measure 15.4.3.A "Structural integrity of ASME Class 1 component(s) is not within the limit."

Operations exited Technical Requirements Manual Technical Normal Conditions Contingency Measure 15.4.3.A at 0438 on March 8, 2011.

H. SAFETY SYSTEM RESPONSES

No safety system responses were expected. None occurred.

II. CAUSE OF EVENT

The event is NUREG-1022, Revision 2, Cause Code B, "Design, Manufacturing, Construction/Installation."

The root cause of the event as determined by Condition Report (CR)-2011-001754 is PWSCC of the Alloy 82 type weld material. The susceptibility of Alloy 82 type weld material to PWSCC is a known industry issue. The Calvert Cliffs Alloy 600 Program Plan and its references document the background, history of issues, susceptibility and evaluation of the pressurizer heater sleeves. This is the first pressurizer heater outer sleeve to weld pad J-Groove weld leak at Calvert Cliffs.

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 (46623) 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 discovery of pressure boundary leakage, although in Mode 6, indicates that the leak 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 if identified in Modes 1 through 4. 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. Analysis confirmed that ASME Code allowable stress limits were satisfied for all design basis conditions.

IV. CORRECTIVE ACTIONS

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

An ASME Code approved welded plug was installed at the N3 location on the Calvert Cliffs Unit 2 pressurizer. Visual examination and surface examination (dye penetrant test) were performed satisfactorily. Post-maintenance pressure test during Mode 3 at normal operating pressure and temperature was performed satisfactorily.

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE

The associated root cause analysis has not been completed at this time. Corrective actions required by the inservice inspection program have been completed. Any additional corrective actions taken as a result of this event will be implemented in accordance with our corrective action program and incorporated in the inservice inspection program as required. If information is subsequently developed, that would significantly affect a reader's understanding or perception of this event, a supplemental Licensee Event Report (LER) will be submitted.

V. ADDITIONAL INFORMATION

A. FAILED COMPONENTS

Pressurizer heater penetration N3.

B. PREVIOUS LERs on SIMILAR EVENTS

A review of Calvert Cliffs' events over the past several years was performed. A previous LER on a similar event is provided:

LER 317/2008-001 Pressure Boundary Leakage by Primary Water Stress Corrosion Cracking

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 Function Identifier	IEEE 805 System Identification
Pressurizer	PZR	AB
Heater	EHTR	AB
Pressure/Level Penetration	PEN	AB