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June 8, 2007

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United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Byron Station, Units 2
Facility Operating License No. NPF-66
NRC Docket No. STN 50-455

Subject: Licensee Event Report (LER) 455-2007-001-00, "Reactor Pressure Vessel Head Control Rod Drive Mechanism Penetration Nozzle Weld Indication Due to an Initial Construction Weld Defect Allowing the Initiation of Primary Water Stress Corrosion Cracking"

Enclosed is an LER for the issue involving the April 9, 2007 discovery of a flaw in the reactor pressure vessel head control rod drive mechanism penetration nozzle weld. This condition is reportable to the NRC in accordance with 10 CFR 50.73 (a)(2)(ii).

Should you have any questions concerning this matter, please contact Mr. William Grundmann, Regulatory Assurance Manager, at (815) 406-2800

Respectfully,

David M. Hoots
Site Vice President
Byron Nuclear Generating Station

DMH/JEL/rah

Attachment LER 455-2007-001-00

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 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, 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
Byron Station Unit 2	05000455	1 of 3

4. TITLE Reactor Pressure Vessel Head Control Rod Drive Mechanism Penetration Nozzle Weld Indication Due to an Initial Construction Weld Defect Allowing the Initiation of 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
04	09	2007	2007	001	00	06	08	2007	N/A	
									FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

6

10. POWER LEVEL

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

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☒ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Byron Station, William Grundmann, Regulatory Assurance Manager	(815) 406-2800

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
N/A	N/A	N/A	N/A	N/A					

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)*

In accordance with NRC order EA-03-009, "Issuance Of Order Establishing Interim Inspection Requirements For Reactor Pressure Vessel Heads At Pressurized Water Reactors," Byron's Unit 2 reactor head was ranked in the low Primary Water Stress Corrosion Cracking (PWSCC) susceptibility category. This low ranking required the initial Control Rod Drive Mechanism (CRDM) penetrations volumetric examinations to be completed in the recent spring 2007 refuel outage (B2R13). During the B2R13 volumetric examination of the Unit 2 CRDM penetration nozzle 68, an ultrasonic test (UT) indication was discovered. Subsequently, bare-metal visual examination was completed, and no evidence of boric acid was identified. A boat sample from CRDM penetration 68 was obtained and analyzed. The root cause was determined to be a lack of fusion during initial construction fabrication that resulted in a weld defect. The weld defect allowed initiation of PWSCC. The indication was repaired and the reactor vessel head returned to service. Future inspections will occur in accordance with NRC Order EA-03-009. This condition had minimal safety consequences. The CRDM penetration indications were identified prior to any through-wall leakage. This condition is reportable to the NRC in accordance with 10 CFR 50.73 (a)(2)(ii), as a condition that resulted in a principal safety barrier being seriously degraded.

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(If more space is required, use additional copies of NRC Form 366A)(17)

A. Plant Condition Prior to Event:

Event Date: April 9, 2007
Unit 2 - Mode 6 – Refueling
Reactor Coolant System (AB) was at ambient temperature and depressurized.

B. Description of Event:

In accordance with the requirements of NRC order EA-03-009, "Issuance Of Order Establishing Interim Inspection Requirements For Reactor Pressure Vessel Heads At Pressurized Water Reactors," Byron's Unit 2 reactor head was ranked in the low Primary Water Stress Corrosion Cracking (PWSCC) susceptibility category. This low ranking required the initial Control Rod Drive Mechanism (CRDM) penetrations nozzle volumetric examinations to be completed in the recent spring 2007 refuel outage (B2R13).

During the B2R13 volumetric examination of the Unit 2 CRDM penetration 68, an ultrasonic test (UT) indication was discovered from 13.5 degrees to 22.5 degrees. The 0-degrees reference is located on the downhill side of the penetration where the nozzle extension is shortest. The indication is located 1.95 inches from the end of the penetration to 2.47 inches towards the J-Groove weld. The bottom toe of the J-Groove weld is located 1.99 inches from the bottom of the tube and the top of the J-Groove weld is located 3.71 inches from the bottom of the penetration. The indication was not surface connected below the J-groove and/or fillet weld.

Following the discovery of the UT indication, a liquid penetrant test (PT) examination was performed to determine if the indication was open to the surface. The PT examination revealed two surface indications: one rounded indication 0.05 inches in diameter and one linear axial indication 0.15 inches long. The indications aligned with the general location and orientation of the UT indication.

Since the indication was consistent with PWSCC, a bare-metal visual (BMV) examination was subsequently completed on 100 percent of the reactor head penetrations, including 360 degrees around each penetration in accordance with NRC order EA-03-009. No evidence of boric acid was identified during the BMV.

Prior to the weld repair, a boat sample from CRDM penetration 68 was obtained for metallurgical evaluation.

This condition is reportable to the NRC in accordance with 10 CFR 50.73 (a)(2)(ii), as a condition that resulted in a principal safety barrier being seriously degraded.

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(If more space is required, use additional copies of NRC Form 366A)(17)

C. Cause of the Event

A boat sample was removed from the penetration to determine the cause of the indications. A PT exam was performed on the boat sample excavation site, and a subsurface linear defect which intersected the axial indication was revealed. A portion of the subsurface defect was captured in the boat sample and was identified as a lack of fusion between the next-to-last weld pass and the tube surface. Additionally, hot cracking and lack of fusion between weld passes were observed in the boat sample. The metallurgical evaluations indicated the axial indication was the result of PWSCC which initiated at a subsurface location and propagated toward the wetted surface of the weld. The initiation of PWSCC is attributed to wetting of the subsurface lack-of-fusion defects which created an atypical crevice corrosion environment in the high stress J-groove weld region.

D. Safety Analysis

This condition had minimal actual safety consequences. The CRDM penetration 68 indications were identified and repaired prior to any through wall leakage occurring.

The CRDM penetration nozzle weld indications were identified as part of a required inspection to look for flaws of this type. Left undetected, the flaw could have propagated through the alloy 600 weld material, and potentially the penetration material, to form a leak path through the RCS pressure boundary. The consequences of this failure would have been high. Although the leak would have been very small, industry experience has shown that boric acid wastage of the carbon steel reactor head is possible.

The flaw was detected as a small indication and no through wall leakage was noted. Verification of no through wall leakage was accomplished through a bare metal head inspection near penetration 68 as well as the remainder of the reactor head penetrations.

Byron Unit 2 will undergo more frequent inspections consistent with the requirements of NRC order EA-03-009.

E. Corrective Actions

The CRDM penetration nozzle number 68 was repaired prior to return to service of the Unit 2 reactor head.

Consistent with NRC Order EA-03-009, Byron Unit 2 reactor vessel head has been reclassified into the high susceptibility category. Consequently, Byron Unit 2 will comply with the Order's requirements for inspections for a high susceptibility reactor vessel head.

F. Previous Occurrences

There have been no previous occurrences of this nature at Byron.