



**Tanya M. Hamilton**  
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Harris Nuclear Plant  
5413 Shearon Harris Road  
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919.362.2502

10 CFR 50.73

Serial: HNP-16-115

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Shearon Harris Nuclear Power Plant, Unit 1  
Docket No. 50-400/Renewed License No. NPF-63

Subject: Licensee Event Report 2016-006-00

Ladies and Gentlemen:

Duke Energy Progress, LLC, submits the enclosed Licensee Event Report 2016-006-00 in accordance with 10 CFR 50.73 for Shearon Harris Nuclear Power Plant, Unit 1. This report details several rejected indications associated with the control rod drive mechanism nozzle penetrations, identified during the reactor vessel closure head inspection completed during the last refueling outage. All rejected indications have been restored to code compliance.

This document contains no regulatory commitments. Please refer any questions regarding this submittal to Jeff Robertson, Manager – Regulatory Affairs, at (919) 362-3137.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Tanya M. Hamilton', written in a cursive style.

Tanya M. Hamilton

Enclosure: Licensee Event Report 2016-006-00

cc: Mr. C. D. Jones, NRC Sr. Resident Inspector, HNP  
Ms. M. Barillas, NRC Project Manager, HNP  
NRC Regional Administrator, Region II



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**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
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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 FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollections.Resource@nrc.gov](mailto:Infocollections.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.

**1. FACILITY NAME**

Shearon Harris Nuclear Power Plant – Unit 1

**2. DOCKET NUMBER**

05000 -400

**3. PAGE**

1 OF 3

**4. TITLE**

Reactor Vessel Closure Head Penetration Nozzle Indications Attributed to Primary Water Stress Corrosion Cracking and a Weld Fabrication Void

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
10	15	2016	2016	006	00	12	14	2016	None	05000 N/A
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
6			<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)		<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)		
			<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)		
			<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)		
			<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)		
10. POWER LEVEL  000			<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)		
			<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)		
			<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> 73.77(a)(1)		
			<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(D)		<input type="checkbox"/> 73.77(a)(2)(i)		
			<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(vii)		<input type="checkbox"/> 73.77(a)(2)(ii)		
			<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A					

**12. LICENSEE CONTACT FOR THIS LER**

## LICENSEE CONTACT

Jeff Robertson, Manager – Regulatory Affairs

## TELEPHONE NUMBER (Include Area Code)

(919) 362-3137

**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	RPV	CB&I	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)

Between October 15 and October 19, 2016, the Shearon Harris Nuclear Power Plant (SHNPP) reactor vessel closure head penetrations were being examined. SHNPP was shut down for a scheduled refueling outage (RFO) for cycle 20 (RFO-20).

Nondestructive examinations identified four rejectable indications impacting four penetration nozzles. Indications associated with nozzles 30, 40, and 51 were indicative of primary water stress corrosion cracking (PWSCC), with the largest indication having an axial extent of 0.372 in. with a through-wall extent of 0.247 in. (39 percent). The fourth indication was identified on nozzle 23 by dye penetrant testing. This indication had a rounded profile indicative of a weld fabrication void, and was 0.307 in. on the major dimension. The weld was fabricated during the previous outage, RFO-19. The void was originally identified during RFO-19 and was acceptable. However, the void has since opened to unacceptable dimensions due to normal operating conditions.

A leak path assessment and a bare metal visual examination of the reactor vessel head top was completed, with no leakage identified. The three PWSCC indications were repaired using the inside diameter temper bead weld method. The fabrication void was removed via localized grinding, with no additional welding necessary. All repairs were completed prior to exiting the refueling outage.

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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Shearon Harris Nuclear Power Plant – Unit 1	05000-400	2016	006	00

**NARRATIVE**

Note: Energy Industry Identification System (EIIIS) codes are identified in the text within brackets [ ].

**A. Background**

Event Date: October 15, 2016 through October 19, 2016 Mode: 6 Reactor Power: 0 percent

In October 2016, Shearon Harris Nuclear Power Plant (SHNPP) was shut down for the scheduled refueling outage (RFO) for cycle 20 (RFO-20). During the outage, the inspection of the reactor vessel closure head (RVCH) [RPV] control rod drive mechanisms (CRDM) [DRIV] penetration nozzles [NZL] occurred. The RVCH was manufactured by Chicago Bridge and Iron, Serial Number T40.

No Structures, Systems or Components (SSCs) were inoperable at the start of this event that contributed to the event. No change in plant mode or in reactor power occurred as a result of this event.

This condition is reportable in accordance with 10 CFR 50.73(a)(2)(ii)(A), as an event or condition that resulted in the condition of the nuclear power plant, including its principal barriers, being degraded.

**B. Event Description**

Nondestructive examinations (NDE) identified four rejectable indications, each impacting a separate penetration nozzle.

Indications associated with nozzles 30, 40, and 51 were identified through ultrasonic (UT) examination and were attributed to primary water stress corrosion cracking (PWSCC). All three PWSCC indications exhibited an axial orientation and were located on the downhill side of the nozzle at the toe of the J-groove weld. The indications had an axial extent of 0.223 in., 0.372 in., and 0.223 in. for nozzles 30, 40, and 51, respectively. The through-wall extent was 0.049 in. (8 percent), 0.247 in. (39 percent), and 0.152 in. (24 percent) for nozzles 30, 40, and 51, respectively.

The fourth indication was identified on nozzle 23 by penetrant testing. This indication had a rounded profile indicative of a weld fabrication void, and was located in the mid-section of the weld bevel on the high hill side of the nozzle. The size of the indication was 0.307 in. on the major dimension. The weld was fabricated during the previous outage, RFO-19, where the void was originally identified and was found to be acceptable. However, the void has since opened to unacceptable dimensions due to normal operating conditions.

The 2004 Edition of the ASME Code Section XI Acceptance Criteria in Table IWB-3663-1 General Note (a) states, "Linear surface flaws of any size in the partial penetration nozzle to vessel (J-groove weld) are not acceptable." A rejectable flaw in a partial penetration nozzle weld in the RVCH does not meet the acceptance standards referenced per ASME Code Case N-729-1. ASME code also provides acceptance criteria for leaving acceptable rounded indications in place. Thus, all rejectable PWSCC and rounded weld fabrication voids required repair and were reportable as a degraded barrier.

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CONTINUATION SHEET**

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Shearon Harris Nuclear Power Plant – Unit 1	05000-400	YEAR 2016	SEQUENTIAL NUMBER 006	REV NO. 00

**NARRATIVE****C. Causal Factors**

The cause of the indications in nozzles 30, 40 and 51 was attributed to PWSCC, which occurs under conditions of high tensile stresses (operating and/or residual), conducive environment (temperature and chemistry), and susceptible material. The CRDM nozzles in the HNP RVCH were originally constructed from Alloy 600 tubing and Alloy 82/182 weld metal. There is widespread industry operating experience that documents PWSCC of Alloy 600 dissimilar metal weld configurations.

Nozzle 23 was repaired during RFO-19 using the inside diameter temper bead (IDTB) weld method. In spite of the precautions in place to ensure first-time weld quality when executing weld repairs on Class 1 components, fabrication voids will occasionally occur. The pre-service examination of the repair identified a rounded indication of 0.135 in. on the major dimension, which is within the acceptance threshold of less than 0.1875 in. During RFO-20, the same indication was identified as having opened to 0.307 in. on the major dimension. This change is the result of normal operating conditions. The fabrication void was removed, thus no further opening of the void is anticipated.

**D. Corrective Actions**

A leak path assessment and a bare metal visual examination of the reactor vessel head top was completed, with no leakage identified. The three PWSCC indications were repaired using the IDTB weld method. The fabrication void was removed via localized grinding, with no additional welding necessary. Penetrant testing was performed, revealing no further fabrication void in the repaired location. All RVCH CRDM nozzles were inspected, as required by ASME Code Case, due to previously identified PWSCC indications.

**E. Safety Analysis**

After PWSCC was identified in RFO-17, inspections of the RVCH were required every refueling outage in accordance with ASME Code Case N-729-1, as conditioned by 10 CFR 50.55a. These inspections include NDE for all RVCH penetrations to identify indications, and are supplemented by bare metal visual examinations of the RVCH. If rejectable indications are found, repairs are completed in accordance with both ASME Code and with relief requests submitted to the NRC on a case-by-case basis. This ensures indications are identified and repaired before any significant impact on the integrity of the weld occurs.

The bare metal visual examination and UT examination did not reveal any through-wall leakage. There was not a breach in the fission product barrier, and the structural integrity of the reactor vessel was not significantly compromised. Therefore, there was no significant impact to the health and safety of the public.

**F. Additional Information**

PWSCC has previously been detected for welds associated with nozzles 5, 17, 38, 49, and 63 (RFO-17), 37 (RFO-18), and 14, 18, and 23 (RFO-19). LERs 2013-001-00, 2013-003-00, and 2015-003-00 all document previous experience with indications in the RVCH CRDM penetration nozzles.