Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth. MA 02360

January 5, 2017

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

SUBJECT: Licensee Event Report 2016-009-00, HPCI Declared Inoperable Due to Failure of IST Surveillance Test

Pilgrim Nuclear Power Station
Docket No. 50-293
Renewed License No. DPR-35

LETTER NUMBER: 2.17.003

Dear Sir or Madam:

The enclosed Licensee Event Report 2016-009-00, HPCI Declared Inoperable Due to Failure of IST Surveillance Test, is submitted in accordance with 10 Code of Federal Regulations 50.73.

If you have any questions or require additional information please contact me at (508) 830-8323.

There are no regulatory commitments contained in this letter.

Sincerely,

Everett P. Perkins, Jr.
Manager, Regulatory Assurance

EPP/sc

Attachment: Licensee Event Report 2016-009-00, HPCI Declared Inoperable Due to Failure of IST Surveillance Test (4 pages)

IE22
NRR

cc: Mr. Daniel H. Dorman
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
2100 Renaissance Blvd., Suite 100
King of Prussia, PA 19406-2713

Ms. Booma Venkataraman, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop O-8C2A
Washington, DC 20555

NRC Senior Resident Inspector
Pilgrim Nuclear Power Station

Attachment

Letter Number 2.17.003

Licensee Event Report 2016-009-00

HPCI Declared Inoperable Due to Failure of IST Surveillance Test

(4 Pages)

NRC FORM 366 (02-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE HPCI Declared Inoperable Due to Failure of IST Surveillance Test

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
									N/A	N/A
11	07	2016	2016	- 009	- 00	01	06	2017	FACILITY NAME N/A	DOCKET NUMBER N/A

9. OEPRATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
N	☐ 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)
10. POWER LEVEL	☐ 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)
100	☐ 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

LICENSEE CONTACT	TELEPHONE NUMER *(Include Area Code)*
Mr. Everett P. Perkins, Jr. - Regulatory Assurance Manager	508-830-8323

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	BJ	P	B580	N					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO				

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

On November 7, 2016, at 1609 [EST], with the reactor at 100 percent core thermal power and steady state conditions, the High Pressure Coolant Injection (HPCI) system was declared inoperable. Pilgrim Nuclear Power Station was performing planned quarterly testing per Technical Specifications 4.13.A.1. During a review of the HPCI pump data taken during the test, it was determined that the recorded vibration reading on the main pump outboard horizontal point (P4H) was 0.8335 in/sec which exceeds the IST required action range high limit of less than or equal to 0.830 in/sec. Accordingly, the HPCI pump was declared inoperable.

The Limiting Condition for Operation Action Statement 3.5.C.2 was entered and planned troubleshooting into the cause of the high vibration was started. This event is reportable under 10 CFR 50.73(a)(2)(v)(D), any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

There was no impact to public health and safety from this condition.

BACKGROUND

The High Pressure Coolant Injection (HPCI) System is provided to ensure that the reactor core is adequately cooled to limit fuel clad temperature in the event of a small break in the nuclear system and loss of coolant which does not result in rapid depressurization of the reactor vessel. The HPCI System permits the reactor to be shut down while maintaining sufficient reactor vessel water inventory until the reactor vessel is depressurized. HPCI continues to operate until reactor vessel pressure is below the pressure at which Low Pressure Coolant Injection (LPCI) operation or Core Spray System operation would maintain core cooling.

If a loss of coolant accident (LOCA) occurs, the reactor scrams upon receipt of a low water level signal or a high drywell pressure signal. The HPCI System starts when the water level reaches a preselected height above the core, or if high pressure exists in the primary containment. The HPCI System automatically stops when a high water level in the reactor vessel is signaled.

The HPCI System is designed to pump water into the reactor vessel over a wide range of pressures in the reactor vessel, from 150 psig to 1120 psig. Accident safety analysis requires the HPCI System deliver 4,250 gpm to the reactor vessel over a range of reactor pressures from 150 psig to 1000 psig, which is well within the design capability of the HPCI System.

EVENT DESCRIPTION

On November 7, 2016, at 1609 [EST], with the reactor at 100 percent core thermal power and steady state conditions, the HPCI System was declared inoperable. Pilgrim Nuclear Power Station (PNPS) was performing planned quarterly testing per Technical Specifications 4.13.A.1. During a review of the HPCI pump data taken during the test, it was determined that the recorded vibration reading on the main pump outboard horizontal point (P4H) was 0.8335 in/sec which exceeds the In-Service Testing (IST) required action range high limit of less than or equal to 0.830 in/sec. Accordingly, the HPCI pump was declared inoperable.

CR-PNP-2016-8657 was initiated to identify the elevated vibration measured on IST vibration point P4H, which is the main pump P4 thrust bearing housing on the output shaft (gearbox end) of the main pump as measured in the horizontal side-to-side direction.

The HPCI main pump vibration characteristics had previously been evaluated and determined to not be detrimental to the operation of the HPCI pump in any of its normal or emergency modes of operation. The PNPS vibration evaluation completed in November 2016, determined this vibration was due to the coincidence of a fundamental structural resonance with the main pump operating speed resulting in the elevated 1 times Revolutions Per Minute (RPM) vibration at the P4H bearing vibration data point.

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CAUSE OF THE EVENT

The direct cause of the condition is the coincidence of a fundamental structural resonance with the main pump operating speed resulting in the elevated 1 times RPM vibration at the P4H bearing vibration data point. The natural frequency of the pump is 68 Hz. The frequency of the running speed is 66.7 Hz. These frequencies are so close together that a resonance is created that results in the high vibration readings at 1 times RPM. The resonance vibration in the HPCI pedestal is what caused the vibration range of the P4H bearing to exceed its IST vibration limit.

The root cause of the event is the pump side-to-side motion on the pedestal. The highest movement is 2.2 mils, measured at the legs on the outboard end of the pump (at P4H). This resulted in a fundamental structural resonance with the main pump operating speed resulting in the elevated 1 times RPM vibration at the P4H bearing vibration data point.

CORRECTIVE ACTIONS

The HPCI P4H bearing high vibration was caused by a natural structural resonance with the main pump operating speed due to the side-to-side motion of the pedestal, and was corrected by adding additional stiffening to the HPCI main pump pedestal. The corrective action to preclude repetition was to install a steel plate between the two legs on the gearbox side (P4H side). Adding the steel plate increased the natural frequency of the pump. The completion of the modification lowered the HPCI pump vibration to an acceptable level.

SAFETY CONSEQUENCES

There are no consequences to general safety of the public, nuclear safety, industrial safety and radiological safety from this event. The HPCI main pump vibration characteristics have been evaluated and it has been determined that the observed and monitored vibration is not detrimental to the operation of the HPCI pump in any of its normal or emergency modes of operation. No safety function was lost during this evolution.

No additional actions to change the natural frequency of the HPCI pedestal or reduce the consequence are necessary.

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NARRATIVE

REPORTABILITY

This report is submitted in accordance with 10 CFR 50.73(a)(2)(v)(D), any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

PREVIOUS EVENTS

A review of PNPS Licensee Event Reports for the past five years did not identify any similar occurrences of declaring HPCI inoperable due to high vibration readings.

REFERENCES:

CR-PNP-2016-8657