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10CFR50.73

ATTN: Document Control Desk
United States Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
Licensee Event Report Submittal

Ladies and Gentlemen:

Enclosed is Licensee Event Report (LER) 2007-006, "Loss of Safety Function and Condition Prohibited by Technical Specifications due to Annulus Exhaust Gas Treatment System Inoperability." There are no regulatory commitments contained in this letter. Any actions discussed in this document that represent intended or planned actions are described for the NRC's information, and are not regulatory commitments.

If you have questions or require additional information, please contact Mr. Jeffrey J. Lausberg, Manager – Regulatory Compliance, at (440) 280-5940.

Very truly yours

Barry S. Allen

Barry S. Allen

Enclosure: LER 2007-006

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III

IE22
NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 8/31/2010

Estimated burden per response to comply with this mandatory collection request: 80 hrs. 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)

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4. TITLE

Loss of Safety Function and Condition Prohibited by Technical Specifications due to Annulus Exhaust Gas Treatment System Inoperability

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
12	21	2007	2007	- 006	- 00	02	19	2008	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

1

10. POWER LEVEL

100

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)*
Kenneth Russell, Compliance Engineer, Regulatory Compliance	(440) 280- 5580

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	BH	CDMP	A609	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 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 December 21, 2007, at approximately 0825 hours, with the plant operating in Mode 1 (Power Operation), at approximately 100 percent power, low flow occurred in the Annulus Exhaust Gas Treatment System (AEGTS) train "B" while train "A" was out of service. The low flow resulted in less than the minimum allowed secondary containment annulus differential pressure. This condition was determined to be reportable in accordance with 10CFR50.73(a)(2)(v)(C) and (D), Loss of Safety Function. Additionally, this condition resulted in entry into Technical Specification Limiting Condition for Operation 3.0.3. Failure to correct this condition within one hour is reportable in accordance with 10CFR50.73(a)(2)(i)(B), a Condition Prohibited by Technical Specifications.

The cause of the low flow was the failure of the discharge damper on the "B" Train. The discharge damper failure was due to side-load wear induced binding of the shaft and shaft extension of the associated Hydramotor actuator. Both the discharge and the recirculation damper actuators were replaced. Maintenance instructions will be revised to ensure proper alignment of the shaft and shaft extension and proper return spring seating. Causal analysis will be performed on any future critical Hydramotor failures.

Since AEGTS is not a core damage mitigation system and does not mitigate Large and Early Containment releases, the unavailability of the AEGTS was determined to be of very low safety significance.

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Energy Industry Identification System Codes are identified in the text as [XX].

I. INTRODUCTION

On December 21, 2007, at approximately 0825 hours, with the plant operating in Mode 1 (Power Operation), at approximately 100 percent power, low flow occurred in the Annulus Exhaust Gas Treatment System (AEGTS) [BH] train "B" while train "A" was out of service. The low flow resulted in less than the minimum allowed secondary containment annulus differential pressure. This condition was determined to be reportable in accordance with 10CFR50.72(b)(3)(v)(C) and (D) as a condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to: (C) control the release of radioactive material; or (D) Mitigate the consequences of an accident. Event Notification Form 43860 documents this report.

This event is being reported in accordance with 10CFR50.73(a)(2)(v)(C) and (D), an event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to (C) Control the release of radioactive material; or (D) Mitigate the consequences of and accident. It was later determined that both train "A" and "B" were inoperable from approximately 0826 hours until approximately 1012 hours, when train "A" was made operable. The unit was in Technical Specification (T.S.) Limiting Condition for Operation (LCO) 3.0.3 for a period of one hour and 46 minutes. Failure to correct this condition within one hour is reportable in accordance with 10CFR50.73(a)(2)(i)(B), a condition prohibited by Technical Specifications

II. EVENT DESCRIPTION

On December 21, 2007, AEGTS train "A " was removed from service to obtain a charcoal sample. At approximately 0825 hours, the charcoal plenum for train "A" was opened to access the charcoal bed and obtain a sample. Opening the plenum resulted in a train "B" low flow alarm and a containment annulus (secondary containment) low differential pressure alarm when annulus differential pressure decreased to about 0.3 inches of vacuum water gauge. The minimum allowed annulus differential pressure by T.S. is 0.66 inches of vacuum water gauge. Based on this indication, AEGTS train "B" and secondary containment were Inoperable resulting in entering T.S. LCO 3.6.4.1, Secondary Containment, Required Action A.1, at approximately 0826 hours. This action requires the restoration of Secondary Containment within 4 hours. Following the determination that both AEGTS trains "A" and "B" were inoperable, T.S. LCO 3.6.4.3, AEGTS, Required Action D.1 was entered at approximately 0832 hours. Action D.1 requires immediate entry into T.S. LCO 3.0.3. T.S. LCO 3.0.3 requires that immediate action be taken to place the unit in Mode 2 within 7 hours, mode 3 within 13 hours, and Mode 4 within 37 hours, respectively.

Actions were immediately taken to close the train "A" charcoal plenum. Closure of the charcoal plenum caused train "B " flow to be restored to normal and Containment Annulus differential pressure was returned to normal at 0833 hours, restoring secondary containment integrity. T.S. 3.6.4.1 Required Action A.1 was exited due to the restoration of Containment Annulus differential pressure. Based on the annulus differential pressure being restored to normal, the AEGTS train "B" was declared operable at 0845 hours and T.S. 3.6.4.3 Required Action D and T.S. LCO 3.0.3 were exited. The plant remained in T.S. 3.6.4.3 Required Action A.1 for AEGTS train "A" being inoperable. Following removal of the safety tagging that was installed for the charcoal sample, AEGTS "A" was

returned to operable status and T.S. 3.6.4.3 Required Action A.1 was exited at approximately 1012 hours, resulting in no open T.S. actions for these systems.

At approximately 1131 hours, AEGTS train "A" auto started due to low flow on the operating AEGTS train "B" while performing testing on AEGTS train "B" dampers [DMP]. The "B" train outlet damper did not move as required to maintain annulus pressure. At 1203 hours, AEGTS train "B" was declared inoperable due to train "B" discharge damper not responding in the open direction to a controller signal. T.S. 3.6.4.3 Required Action A.1 was entered.

Following repair of the AEGTS train "B" outlet damper on December 22, 2007, at approximately 0611 hours, train "B" was placed in standby. At approximately 0624 hours, train "B" was started to perform post maintenance testing to restore operability. A low flow alarm was received and at approximately 0706 hours, it was determined that the AEGTS train "B" recirculation damper had failed full closed. Attempts to cycle the recirculation damper locally from the control linkage were unsuccessful. AEGTS train "B" remained inoperable.

On December 23, 2007, at approximately 0219 hours, following repair and successful post maintenance testing of the AEGTS train "B" recirculation damper, the AEGTS train "B" was declared operable.

During the investigation of the damper failures, it was determined that both train "A" and "B" had been inoperable on December 21, 2007, from approximately 0826 hours until approximately 1012 hours, when train "A" was made operable.

III. CAUSE OF EVENT

During the evaluation of this event, it was determined that the combination of AEGTS train "B" discharge damper being inoperable (determined at 1131 hours on December 21, 2007), with the open train "A" plenum door, likely caused the initial train "B" low flow alarm.

The cause of the discharge damper failure was the result of issues with the damper actuators stemming from a less than adequate analysis process for Hydramotor related failures. Although hydramotor issues have been identified previously in the corrective action program, previous corrective actions did not provide for an ongoing process that would identify the actual failure mechanism of the component. An on-going evaluation of emerging hydramotor issues with associated corrective actions is required to improve equipment reliability.

Both dampers are driven by ASCO NH91 style hydramotors through linear converters. From failure analysis by the FirstEnergy Nuclear Operating Company (FENOC) BETA Lab, it was determined that the discharge damper most likely failed to stroke due to side-load wear induced binding of the shaft and shaft extension. The side loading was determined to be caused either by mis-alignment during assembly or a defective return spring.

The cause of the potential mis-alignment was determined to be the result of maintenance instructions that lacked adequate provisions to ensure proper alignment of hydramotor shafts and their associated linear converters. Additionally, the criticality of proper alignment (or the negative effects of side loading) of hydramotor shafts and their associated linear converters was not fully understood by the

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maintenance personnel involved in the maintenance / refurbishment of hydramotors, specifically, the potential that side loading can result in the failure of the hydramotor to function.

Failure analysis at the FENOC BETA Lab determined that the stroke on the failed recirculation damper actuator was slow. Given that the hydramotor had been rebuilt by the vendor just prior to installation, and that the Hydramotor failed to stroke after only 5 months of service, and there were no signs of side loading, it is concluded that the failure was related to a vendor parts issue associated with the pump assembly.

IV. EVENT ANALYSIS

The AEGTS maintains a negative pressure differential between the containment vessel annulus and the outside so that leakage from the containment vessel will be detained, mixed, diluted and filtered before release to the unit vent. This system is designed to function continuously during normal, shutdown and refueling operations, during loss of offsite power periods and following a LOCA to maintain a negative pressure differential between the containment vessel annulus ambient and the outside. Emergency core cooling systems, designed to cool the reactor core and prevent core damage were operable during this condition. Containment isolation systems, designed to isolate leakage from the containment, were also operable.

AEGTS is not a core damage mitigation system and is not modeled in the Perry Probabilistic Risk Assessment (PRA). The PRA is concerned with Large and Early Containment releases. Large releases are characterized as un-scrubbed releases of airborne fission products to the environment following a core damage event. Early releases refer to a release prior to effective implementation of off-site emergency response and protective actions.

The availability of AEGTS would not mitigate a large or early release to the environment. Therefore, the unavailability of both trains for one hour and 46 minutes is of very low safety significance.

V. CORRECTIVE ACTIONS

Both the discharge and the recirculation damper actuators were replaced.

In order to improve failure analysis and thus prevent recurrent problems, a hydramotor performance/failure analysis form will be developed and included in the hydramotor refurbishment task list. The form will ensure that a thorough performance / failure analysis is performed. The completed form will be forwarded to the Subject Matter Expert for review and trending.

To improve the assembly process, a methodology will be developed to ensure adequate alignment of the hydramotor shaft and linear converter input shafts during reassembly. Specific directions will be added to incorporate the alignment process into the appropriate maintenance instructions. Cautions will be added to warn of the consequences of misalignment. Independent verification of alignment will be required. Maintenance instructions will be revised to include acceptance criteria for replacement return springs. A test will be developed to check for side loading after the shaft has been coupled to the linear converter and the test will be incorporated into the appropriate refurbishment instructions. Stroke time testing and acceptance criteria will also be included in the instructions.

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A training Needs Analysis will be performed on the new process for hydramotor maintenance. The lessons learned from the industry experience review are to be included in this analysis. The results will be reviewed by the maintenance training review committee.

The lessons learned from this investigation will be discussed with maintenance personnel involved in the refurbishment of hydramotors. Specifically, attention is to be given to the importance of hydramotor shaft alignment with the process component, and how side loading could be introduced by the split coupling or a less than adequate return spring.

VI. PREVIOUS SIMILAR EVENTS

LER 2003-006 documents the failure of a hydramotor that caused a temperature control valve for a control complex chiller to fail. The control complex chiller in the other train was already in a secured status and inoperable for maintenance. With both chillers inoperable, the systems supported by the chillers were determined to be inoperable. The cause of the failure of the hydramotor in that LER was determined to be an electrical malfunction in the motor winding. The corrective actions from that failure were not similar to the failure documented by this event. However, the investigation of the event in LER 2003-006 documented that there had been numerous failures of hydramotors at Perry and throughout the industry. Understanding other hydramotor failure mechanisms and implementation of associated corrective actions should result in improved reliability of the plant's hydramotors.

VII. COMMITMENTS

There are no regulatory commitments contained in this report. Actions described in this document represent intended or planned actions, are described for the Nuclear Regulatory Commission's information, and are not regulatory commitments.