FENOC
FirstEnergy Nuclear Operating Company

Perry Nuclear Power Station
10 Center Road
Perry, Ohio 44081

Mark B. Bezilla
Vice President

440-280-5382
Fax: 440-280-8029

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L-09-211

10 CFR 50.73(a)(2)(iv)(A)

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

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

Enclosed is Licensee Event Report (LER) 2009-001, "MSR High Level Signal Causes Turbine Trip and Reactor Protection System Actuation." There are no regulatory commitments contained in this submittal.

If there are any questions or if additional information is required, please contact Mr. Robert Coad, Manager – Regulatory Compliance, at (440) 280-5328.

Sincerely,

Mark B. Bezilla

Enclosure:
LER 2009-001

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

MSR High Level Signal Causes Turbine Trip and Reactor Protection System Actuation

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
06	21	2009	2009	- 001	- 00	08	20	2009	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)
- ☐ 20.2201(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)*
Perry Nuclear Power Plant, John Pelcic, Compliance Engineer	(440) 280-5824

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

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 June 21, 2009, at 1750 hours, the reactor protection system (RPS) automatically actuated due to receipt of a turbine control valve fast closure signal. All control rods fully inserted and there were no complications during the shutdown. Reactor coolant pressure and level were maintained within expected parameters.

The event was caused by receipt of an invalid high water level signal from moisture separator reheater (MSR) 1B instrumentation, which resulted in a main turbine trip, fast closure of the turbine control valves, and activation of the RPS. Incorrect adjustment of the MSR level switches following maintenance in the recent refueling outage was the direct cause for their actuation. Failure to evaluate industry operating experience, not documenting as-found deficiencies in the corrective action program, not considering non-safety equipment as important, and improper work package/procedure use and adherence contributed to this event.

The MSR level switches were subsequently adjusted and calibrated satisfactorily to assure proper operation. Maintenance procedures and templates will be revised to prevent recurrence of incorrect level switch adjustment.

The safety significance of this event is considered to be low. This event is reported in accordance with 10 CFR 50.73 (a)(2)(iv)(A) as an event or condition that resulted in a manual or automatic actuation of the reactor protection system including reactor scram or reactor trip.

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NARRATIVE

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

INTRODUCTION

On June 21, 2009, at 1750 hours, with the plant in Mode 1 (i.e., Power Operation) and the reactor operating at 100 percent of rated thermal power (RTP), an automatic Reactor Protection System (RPS) [JC] actuation occurred due to a turbine control valve fast closure activation. A moisture separator reheater (MSR) [SB] high water level signal resulted in a main turbine trip and fast closure of the turbine control valves. At 2058 hours, notification was made to the NRC Operations Center (ENS Number 45147) in accordance with 10 CFR 50.72(b)(2)(iv)(B), as an event or condition that results in actuation of the reactor protection system when the reactor is critical. This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) as an event or condition that resulted in a manual or automatic actuation of the reactor protection system including reactor scram or reactor trip.

EVENT DESCRIPTION

On June 21, 2009, the plant was in Mode 1, operating at 100 percent RTP. The plant was in a normal electrical line-up with all three emergency diesel generators operable and available at the time of the event. There were no testing activities, reactivity manipulations, or plant evolutions in progress. Emergency core cooling systems were operable.

At 1750 hours on June 21, 2009, an automatic reactor protection system actuation occurred due to a turbine control valve fast closure activation of the RPS. An invalid high water level signal from MSR 1B was received which caused a main turbine trip and fast closure of the turbine control valves. All control rods fully inserted. No emergency core cooling systems initiated or were utilized to respond to the event. There were no other reportable actuations. At 1755 hours, the motor feed pump was started for level control and maintained reactor water level within the normal operating band. The reactor scram was reset at 1803 hours. Off-normal operating instructions for turbine trip and reactor scram were exited at 0140 hours on June 22, 2009.

The plant remained in Mode 3 (i.e., Hot Shutdown) while repairs were made. At 2302 hours on June 23, 2009, operators placed the mode switch in Startup/Standby to enter Mode 2 (i.e., Startup).

CAUSE OF EVENT

The turbine trip/reactor scram was the result of three upper micro-switches of the Magnetrol level switch assemblies on MSR 1B closing to energize the MSR high level trip relays in the turbine trip logic.

The micro-switches on the MSR 1B Magnetrol level switch assemblies were replaced in March 2009 during refueling outage 12 (1R12). Following replacement, adjustment of the micro-switch mounting assemblies/linkages was not performed. This placed the MSR level switches in a vulnerable condition such that vibration and temperature changes experienced during plant operation were sufficient to actuate the micro-switches on MSR 1B and complete the turbine trip logic. The resultant turbine trip initiated the RPS logic which caused the reactor scram. An actual high water level condition in MSR 1B did not exist.

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NARRATIVE

The root cause for not adjusting the MSR 1B level instrument micro-switches was that industry operating experience (OE) (OE19872) for improper linkage adjustment of MSR level switches was not evaluated for applicability to Perry. As a result, potential key learnings were not incorporated into plant procedures. In this case, key manufacturer's instruction manual recommendations were not included in the instrument calibration instruction or the 1R12 preventive maintenance work order for performing MSR level switch calibration checks.

The following causes contributed to the event:

- The step sequence specified in the work order performing the switch calibration checks was not followed. No As-Found calibration of the Magnetrol level switches was performed; the Instrumentation and Control (I&C) technicians proceeded to replace the micro-switches. If the intended sequence had been followed, the I&C technicians would have referred to the vendor manual that describes the set-up and adjustment of the micro-switches when replaced. The technicians did not obtain documented permission to skip the As-Found calibration. This skipped step in the process prevented early identification of improper switch adjustments. The manufacturer's instruction manual was not referenced when the micro-switches were replaced.

- Issues associated with maintenance of MSR level switches were not entered in the corrective action process (CAP). These issues included unacceptable micro-switch as-found conditions and micro-switch replacements. As a result, past maintenance experience was not available for trending or use in 1R12 work planning.

- Non-safety plant equipment was not considered as significant by the workers.

EVENT ANALYSIS

The moisture separator reheaters (MSRs) are large cylindrical pressure vessels designed to improve the quality and increase the internal energy of the high pressure turbine exhaust steam. The MSRs increase steam efficiency through the low pressure turbine. Water level in the MSR tanks is controlled to prevent moisture carryover which could damage the turbine. Water in the MSRs is routed to individual drain tanks.

Perry has four MSR tanks identified as 1A, 1B, 2A, and 2B. Each MSR tank has three Magnetrol Model 402 level switches installed on exterior instrument level trees to provide a turbine trip signal on MSR high water level. Each level switch has two (upper and lower) M-1 type mirco-switches.

Initial troubleshooting subsequent to the scram determined that the upper micro-switch contacts on the three MSR 1B Magnetrol level switch mechanisms were closed, making up the main turbine trip logic from MSR 1B. The lower contacts were found open as expected for normal MSR water level.

Prior to the scram, MSR drain tank level control was in normal band and steady. No MSR 1B level alarms were received to indicate a high MSR water level. The first indication of a problem was the main turbine trip. A review of other level indications associated with MSR 1B did not indicate a high water level condition or any changes in MSR 1B Drain Tank level control parameters. The MSR 1B drain tank parameters were consistent with the 1A, 2A and 2B drain tank parameters.

NARRATIVE

The reactor scram was uncomplicated in that all control rods fully inserted, reactor coolant pressure and level were maintained within expected parameters, and no emergency systems actuated in response. The RPS functioned as designed.

The scram event, including plant response, is bounded by the Turbine Trip transient evaluated in the Updated Safety Analysis Report (USAR) Chapter 15, Accident Analysis, section 15.2.3. No plant parameters due to the scram challenged the transients described in the USAR. This transient is categorized as an incident of moderate frequency.

A probabilistic risk assessment (PRA) was performed for the scram event. The PRA calculated a change in core damage frequency (delta CDF) in this case to be 1.7E-07. Since Perry's Large Early Release Frequency (LERF) is an order magnitude less than the core damage frequency, the corresponding change in LERF will be on the order of 1.0E-08. Plant configurations with changes in CDF of less than 1.0E-06 and LERF of less than 1.0E-07 are not considered to be significant risk events.

Based on the above information, this event is considered to be of low safety significance.

CORRECTIVE ACTIONS

The upper micro-switch mounting assemblies and linkages for the three Magnetrol level switch assemblies on MSR 1B were adjusted to ensure the micro-switch contacts were opening and closing properly and that the switch travel was optimized. The switches were then calibrated satisfactorily. The Magnetrol level switch assemblies on MSRs 1A, 2A, 2B were checked for proper alignment and calibration. Micro-switch trip and reset verifications were performed to confirm proper operation prior to startup; adjustments to the switches were made as necessary. A monitoring plan to check the MSR high level turbine trip contacts during the current operating cycle was established.

The preventative maintenance (PM) tasks and component templates for MSR 1A/B and 2A/B level instruments will be revised to include applicable good practices (such as verifying the "As-Left" contact positions are open) determined from the troubleshooting and maintenance work orders implemented in response to this event. The PM tasks will include the applicable good practices from the monitoring plan orders performed to check the integrity of the MSR logic switch positions.

Instruction ICI-B1-0, Generic Level Instrumentation Calibration (B1-0), will be revised to include manufacturer's instructions for micro-switch replacement and adjustment. The calibration section of the Magnetrol vendor manual will be revised to include the level switch adjustment information from the level switch replacement section.

A lessons learned document will be created, for training purposes, that aligns the weaknesses identified in the evaluation of industry OE for improper level switch adjustments and controller settings.

The following lessons learned from this event will be reviewed with I&C personnel:

- Refer to technical manuals and submit procedure change requests as necessary to ensure

calibration instructions contain the necessary information.

- Importance of collecting "As-Found" data.
- Importance of generating condition reports to capture failed components requiring replacement to provide a data stream for trending.
- Procedure use and adherence for performing order operations out of sequence and the possibility of skipping a step.

Work orders were created to perform calibration checks or functional checks on similar applications in the plant of Magnetrol level switches having the M-1 type micro-switch assemblies.

PREVIOUS SIMILAR EVENTS

A review of LERs and the corrective action program database for the past three years did not identify any previous similar events or condition reports relevant to MSR failure mechanisms which defined this event. Corrective actions for the following RPS actuations were reviewed. They would not reasonably be expected to have prevented the MSR scram.

LER 2007-004, Automatic RPS Actuation Due to Feedwater Control Power Supply failure

LER 2007-001, Automatic RPS Actuation Due Reactor Coolant Level Decrease

LER 2006-005, Decreasing Instrument Air Pressure Results in Manual RPS Actuation

COMMITMENTS

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