Entergy

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

Pilgrim Nuclear Power Station

December 18, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

SUBJECT: Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
Docket No.: 50-293
License No.: DPR-35

Licensee Event Report 2013-010-00, Automatic Group I Primary Containment Isolation Actuation During Plant Start Up Due To High Reactor Water Level

LETTER NUMBER: 2.13.082

Dear Sir or Madam:

The enclosed Licensee Event Report (LER) 2013-010-00, "Automatic Group I Primary Containment Isolation Actuation During Plant Start Up Due To High Reactor Water Level" is submitted in accordance with 10 CFR 50.73.

This letter contains no commitments.

Please do not hesitate to contact me at (508) 830-8403, if there are any questions regarding this submittal.

Sincerely,

Joseph R. Lynch
Licensing Manager

JRL/fm

Attachment 1: Licensee Event Report 2013-010-00

IE22
NRR

cc:

Mr. William M. Dean
Regional Administrator, Region 1
U.S. Nuclear Regulatory Commission
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USNRC Senior Resident Inspector
Pilgrim Nuclear Power Station

Attachment 1
Letter Number 2.13.100

Licensee Event Report 2013-010-00

Automatic Group I Primary Containment Isolation Actuation
During Plant Start Up Due To High Reactor Water Level

(4 Pages)

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

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 Service 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Pilgrim Nuclear Power Station	05000293	1 OF 4

4. TITLE

Automatic Group I Primary Containment Isolation Actuation During Plant Startup Due to Reactor High Water Level

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVNO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	
10	19	2013	2013	010	00	12	18	2013	FACILITY NAME N/A	DOCKET NUMBER

9. OPERATING MODE

N

10. POWER LEVEL

1%

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

NAME	TELEPHONE NUMBER (Include Area Code)
Joseph R. Lynch, Licensing Manager	(508)-830-8403

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
				No					

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)*

On Saturday, October 19, 2013 at 0330 [EDT] with the reactor critical at 1% core thermal power (CTP), and the mode switch in START UP, a high reactor water level condition (+55") resulted in a valid Group I primary containment isolation signal and resultant closure of the main steam isolation valves (MSIV), MSIV drain line valves, and reactor recirculation system sample line valves. The plant was in the process of starting up with reactor pressure at approximately 290 psig with a corresponding reactor coolant temperature for that pressure. Reactor startup was suspended and control rods were manually reinserted. Reactor water level was recovered and maintained within normal bands. Plant systems responded as designed to the Group I containment isolation signal.

The direct cause of MSIV isolation was automatic actuation of the Group I containment isolation signal due to high reactor high water level with the mode switch in START UP. The cause of the high reactor water level was due to unexpected rapid opening of three turbine steam bypass valves. The reason the bypass valves rapidly opened was due to a malfunction of the mechanical pressure regulator (MPR). The MPR malfunctioned because an increased error signal between turbine steam pressure and the MPR setpoint due to friction between the MPR pilot valve and the pilot valve bushing resulting from lack of rotation of the pilot valve bushing. Corrective action was taken to flush the needle valve that controls oil flow to the pilot valve bushing and exercise of the pilot valve bushing to restore proper rotation.

This event posed no threat to public health and safety.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
Pilgrim Nuclear Power Station	05000293	2013 –	010	– 00	2 OF 4

NARRATIVE

BACKGROUND:

The final safety analysis report (FSAR) identifies that the turbine generator control system has a power generation function to maintain nuclear steam at an essentially constant pressure so that pressure induced core reactivity changes are controlled; to provide turbine generator speed load controls for startup and operation; and to limit turbine overspeed. This system generates coordinated positioning signals for the main turbine control valves, combined intermediate valves, and the turbine bypass valves. The bypass valves divert reactor steam to the main condenser to relieve steam pressure.

The steam pressure regulator portion of the system consists of two independent pressure regulators; one is of the hydraulic-mechanical design (MPR) and the other is of the electro-hydraulic design (EPR). These subsystems are relied on to control main steam pressure. The MPR system is used for plant start up pressure control (150 to 1050 psig) until pressure reaches the low end of the EPR control range (between 910 to 1010 psig).

MPR operation relies on proper control of a pilot valve, a servomotor, and a proportional feedback system. The servomotor sends an output signal to the control valve relays via the compound control mechanism. MPR feedback systems are provided to reduce lever and piston movement to dampen system transients. The pilot valve ports oil to the servomotor relay piston and has three operating areas used to control oil flow. The pilot valve piston moves up and down inside a rotating bushing based on control bar lever position. The bushing rotates at >1 rpm to minimize static friction between the bushing and the pilot valve piston. The bushing is rotated by a small oil turbine and a worm gear on the bushing. A needle valve is adjusted to control oil turbine speed.

Prior to pressurizing the main steam lines, the main turbine lube oil system should be running to supply operating oil to the turbine generator control system. At plant startup, the turbine bypass valves should be closed. MPR set point verification is required at approximately 200 psig. This MPR set point verification ensures steam pressure is regulated at the setpoint limit and bypass valve operation is slow and controlled.

EVENT DESCRIPTION:

On Saturday, October 19, 2013 at 0330 [EDT] with the reactor critical at 1% core thermal power (CTP), and the mode switch in START UP, a high reactor water level condition (+55") resulted in a valid Group I primary containment isolation signal and resultant closure of the main steam isolation valves (MSIV), MSIV drain line valves, and reactor recirculation system sample line valves. The plant was in the process of starting up with reactor pressure at approximately 290 psig with a corresponding reactor coolant temperature for that pressure. Reactor startup was suspended and control rods were manually reinserted. Reactor water level was recovered and maintained within normal bands. Plant systems responded as designed to the Group I containment isolation signal.

CAUSE OF THE EVENT:

The direct cause of MSIV isolation was automatic actuation of the Group I primary containment isolation signal due to high reactor high water level with the mode switch in START UP. The cause of the high reactor water level was due to unexpected rapid opening of three turbine steam bypass valves. The reason the bypass valves rapidly opened was due to a malfunction of the mechanical pressure regulator (MPR). The MPR malfunctioned because of an increased error signal between turbine steam pressure and the MPR setpoint due to friction between the MPR pilot valve and the pilot valve bushing resulting from lack of rotation of the pilot valve bushing.

Unfiltered/degraded oil was identified as a potential contributing cause of the event.

CORRECTIVE ACTIONS:

Corrective action was completed to flush the needle valve that controls oil flow to the MPR pilot valve bushing and to exercise the MPR pilot valve bushing. An Operations compensatory measure was also established to verify proper rotation of the MPR pilot valve bushing during plant startup.

Additional corrective action planned includes:

- Revise operator tour and plant startup procedures to include verification of MPR pilot valve bushing rotation.
- Establish a preventative maintenance task for periodic replacement of turbine lube oil filter elements in the main turbine lube oil filter assembly.

These actions are captured in the Corrective Action Program under Condition Report, CR-PNP-2013-7066.

ASSESSMENT OF SAFETY CONSEQUENCES:

The event occurred with reactor power at approximately 1% and the mode switch in the START UP position. The reactor vessel pressure was approximately 290 psig with reactor water temperature at saturation temperature for that pressure.

Core standby cooling systems (CSCS) were operable prior to the event. These systems are engineered safety systems designed to provide, in conjunction with other systems, adequate core cooling to the reactor core. These systems consist of the high pressure coolant injection (HPCI) system, automatic depressurization system (ADS), core spray (CS) system, and the residual heat removal (RHR) system in the low pressure core coolant injection (LPCI) mode. Although not part of the CSCS, the reactor core isolation cooling (RCIC) system is capable of providing water to the reactor vessel for high pressure core cooling, similar to the HPCI System.

During the event, offsite power was available from one of the two 345 kV power feeds via Line 355 to the startup transformer. The 345kV feed from Line 342 was not in-service due to the performance of maintenance. An additional offsite power feed was provided via the 23 kV feed to the shutdown transformer. Both diesel generators, and the station blackout diesel where operable to provide onsite 4kV power if needed to the station safety busses.

The turbine generator control system experienced a malfunction of the MPR steam pressure controller pilot valve. A failure of the turbine-generator control system is addressed in the FSAR. The MPR regulator is not a safety system and may either open or close turbine bypass valves. The FSAR addresses plant response to turbine-generator control system malfunction and credits operation of required safety systems for mitigating potential adverse effects. Core thermal power was not above 25 %, therefore automatic actuation of the Group I primary containment isolation valves was not needed to protect reactor fuel safety limits. However, automatic Group I primary containment isolation valves actuated in accordance with design to provide main turbine and main steam line protection from water intrusion resulting from reactor vessel overfill event.

There were no other required automatic safety system protective actuations needed based on the MPR malfunction and subsequent high reactor water level event. Plant operators recovered the plant manually using site procedures written to address applicable plant conditions. As a result, this event posed no threat to public health and safety.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
Pilgrim Nuclear Power Station	05000293	2013 –	010	– 00	4 OF 4

REPORTABILITY:

This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A) – Any event or condition that resulted in manual or automatic actuation of any system listed in paragraph 10 CFR 50.73 (a)(2)(iv)(B). General containment isolation signals affecting containment isolation valves in more than one system or multiple main steam isolation valves.

This event was initially reported to the NRC in accordance with 10 CFR 50.72(b)(3)(iv)(A) as documented in Event Number #49454.

PREVIOUS OCCURRENCES:

A review was performed for similar Pilgrim Station Licensee Event Reports (LERs) submitted to the NRC. The review focused on LERs involving actuation of Group I containment isolation on high reactor water level during plant startup. The review identified LER 2003-02. This LER event occurred at higher reactor pressure and was the result of human error and involving use of the turbine bypass override jack.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES:

None

REFERENCES:

Condition Report, CR-PNP-2013-7066, Automatic actuation of Group 1 containment isolation signal.