Entergy

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

Michael A. Balduzzi
Site Vice President

May 11, 2006

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

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

Licensee Event Report 2006-001-00

LETTER NUMBER: 2.06.034

Dear Sir or Madam:

The enclosed Licensee Event Report (LER) 2006-001-00, "Manual Scram due to High Offgas Recombiner Temperature Resulting from Inadequate Preventive Maintenance of Recombiner Preheater Pressure Control Valve Controller," is submitted in accordance with 10 CFR 50.73.

This letter contains no commitments.

Please do not hesitate to contact Bryan Ford, (508) 830-8403, if there are any questions regarding this subject.

Sincerely,

Michael A Balduzzi

M.A. Balduzzi

DWE/dm
Enclosure

cc: Mr. James Shea, Project Manager
Plant Licensing Branch I-1
Division of Operator Reactor Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
One White Flint North O-8C2
11555 Rockville Pike
Rockville, MD 20852

INPO Records
700 Galleria Parkway
Atlanta, GA 30399-5957

Mr. Samuel J. Collins
Regional Administrator, Region 1
U.S. Nuclear Regulator Commission
475 Allendale Road
King of Prussia, PA 19406

Senior Resident Inspector
Pilgrim Nuclear Power Station

IE22

1. NRC Form 366 U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503.

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TITLE (4)

Manual Scram due to High Offgas Recombiner Temperature resulting from Inadequate Preventive Maintenance of Recombiner Preheater Pressure Control Valve Controller

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	05000
03	13	2006	2006	001	00	05	11	2006	FACILITY NAME: N/A	DOCKET NUMBER: 05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)			
POWER LEVEL (10)	43	20.2201(b)	22.2203(a)(3)(i)	50.73(a)(2)(i)(C)	50.73(a)(2)(vii)
		22.2202(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(3)(1)(i)(A)	50.73(a)(2)(iii)	50.73(a)(2)(ix)(A)
		20.2203(a)(2)(ii)	50.36(3)(1)(ii)(A)	X 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

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Bryan Ford, Licensing Manager	(508) 830-8403

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
E	WF	PIC	F180	Y					

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE(15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

ABSTRACT

On March 13, 2006, at 1808 hours, an unplanned scram was manually initiated while at 43 percent reactor power. This procedurally required action was taken because of high temperature in the Augmented Offgas (AOG) system recombiner. There were no complications encountered during the response to the scram.

The root cause of the event was the failure of the controller of a pressure control valve (PCV) that supplies steam dilution flow PCV and steam heating to the recombiner's preheater. The failure was due to inadequate preventive maintenance of the controller. Corrective action taken included replacement of the pressure control valve controller and repair of a hand operated valve that enables steam to bypass the pressure control valve. Corrective action planned includes developing preventive maintenance for the AOG pressure controllers, training, and evaluating changes to procedures

The event occurred during power operation. The reactor vessel pressure was about 967 psig with the reactor vessel water temperature at the saturation temperature for that pressure. The event posed no threat to public health and safety.

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TEXT (If more space is required, use additional copies of NRC Form 366A) **(17)**

BACKGROUND

The main condenser gas removal system functions to remove air, non-condensible gases, and water vapor from the main condenser. The non-condensible gases and water vapor are discharged from the after-condenser for subsequent processing in the Offgas system that includes a hold-up line.

The Augmented Offgas (AOG) system provides additional treatment. The Offsite Dose Calculation Manual (ODCM) requires the AOG system be in service at greater than 50 percent reactor power with allowances to remove the system from service. When the AOG system is in service, the offgas upstream of the Offgas system hold-up line is directed to the AOG system. The AOG system includes steam jet compressors, pre-heaters, catalytic recombiners, after-condensers and water separators, hydrogen analyzers, cooler condensers, moisture separators, pre-filters, charcoal absorbers, and radiation monitors. After the offgases are processed in the AOG system, non-condensible gases from the AOG system are directed to the Offgas system hold-up line.

The principal mechanical components of the AOG system are connected in a series-parallel arrangement that consists of two trains. The system's two in-parallel recombiners are located downstream of the system's two in-parallel preheaters and upstream of the system's two in-parallel offgas condensers. A recombiner functions to recombine oxygen and hydrogen formed through the radiolytic decomposition of water exposed to radiation in the reactor vessel. A preheater functions to preheat diluted offgas before entry into the recombiner.

The diluted offgas piping is equipped with a valve for pressure relief and instrumentation for sensing and indicating temperature and pressure. Steam for heating the diluted offgas is piped to the preheater. The piping for heating is equipped with instrumentation including those for pressure sensing, pressure indication, pressure alarm, and control of the steam pressure supplied to the preheater. The offgas heated in the preheater is piped to the respective recombiner. A recombiner is equipped with a catalyst and instrumentation. The instrumentation functions to sense the pressure and temperature of the offgas from the preheater, the temperature of the recombiner vessel, and temperature of the offgas exiting the recombiner.

As planned, Pilgrim Station was removed from electrical power generation service on March 11, 2006, for the planned reconnection of the Unit Auxiliary Transformer (UAT). While the turbine-generator was removed from electrical power generation service, the reactor was maintained in a critical condition, at about 14 percent power, with steam directed to the main condenser via the turbine steam bypass valves. After reconnection of the UAT, and as reactor power was gradually increased, Pilgrim Station returned to electrical power generation service at 1832 hours on March 11th. Routine plant operations continued for the planned return to full reactor power operation, including the following activities.

At 0438 hours on March 12th the AOG system was put into service. As part of this activity, the hand operated valve (1-HO-154) that enables the bypass of steam around the AOG pressure valve PV-9239 would not open.

At about 1610 hours on March 13th, a reactor operator noted the AOG preheater steam heating pressure was about 280 psi, with the pressure valve PV-9239 in manual control. Downstream of PV-9239, the AOG dilution steam was being supplied through a hand operated valve that enables steam bypass around pressure valve PV-9238. Reactor power was about 82 percent, and reactor power was being increased gradually, at about 15 MW thermal per hour. The operations crew anticipated that as reactor power increased the inlet pressure to PV-9239 would increase.

At 1745 hours on March 13th, at about 83 percent reactor power, a Control Room alarm occurred indicating low steam dilution flow supplied to the AOG system. As part of a pre-evolution briefing, two non-licensed operators were directed to adjust the steam pressure at PV-9239. The briefing included the possibility of bypassing PV-9239 in accordance with the AOG system operating procedure.

By 1753 hours, communications at PV-9239 were established and initial attempts were made to throttle open PV-9239. One of the operators reported the valve did not open when an increased pressure demand signal to the controller of PV-9239 was attempted twice. On the third attempt the controller of PV-9239 indicated the valve was closing. Control Room personnel observed the steam pressure from PV-9239 steadily decreasing, and the operators were directed to open hand operated valve 1-HO-154 to enable steam bypass around PV-9239. The bypass valve could not be opened. At 1757 hours, the vapor valves, closed automatically due to low steam dilution flow. The low dilution trip was bypassed and the vapor valves were reopened. At 1803 hours, a Control Room alarm occurred indicating an AOG recombiner high temperature condition of greater than about 875 degrees F and the procedure for abnormal recombiner temperature was entered.

At 1805 hours, the licensed shift control room supervisor directed reactor power be decreased in accordance with the power reduction procedure and reactor power was being decreased by the adjustment of reactor recirculation flow and insertion of selected control rods. Meanwhile, additional operator attempts were made to adjust the steam pressure from PV-9239. The pressure controller of PV-9239 was placed in the automatic mode and then back to the manual mode several times in the attempt to open PV-9239. This action ultimately resulted in the return of the pressure controller demand and position signals and the controller began to control PV-9239. AOG steam dilution flow was restored and the pressure from PV-9239 was observed to increase and steady at about 350 psig. Despite having restored normal AOG recombiner parameters, the recombiner vessel bottom temperature increased to a reported value of 1074 degrees F. After verifying the recombiner temperatures were >1000 degrees F and in accordance with approved procedure, the shift senior licensee operator directed a manual scram of the reactor.

EVENT DESCRIPTION

On March 13, 2006, at about 1808 hours, a manual actuation of the reactor protection system (RPS) and reactor scram occurred while at about 43 percent reactor power. The RPS actuation was the expected response to intentionally depressing the manual scram pushbuttons of RPS Channels 'A' and 'B', and was taken in accordance with procedure because the AOG recombiner temperature was greater than 1000 degrees F.

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The reactor vessel water level decreased to about -21 inches (narrow range level) due to the decrease in the void fraction in the reactor vessel water. Plant systems responded to the event as designed including an automatic actuation of the RPS, Primary Containment Isolation Control System (PCIS) and Reactor Building Isolation Control System (RBIS) due to the decrease in reactor water level.

PCIS actuation resulted in the automatic closing of the Primary Containment system (PCS) Group 2 and Group 6/Reactor Water Cleanup (RWCU) system isolation valves that were open. The normally closed PCS Group 3/residual heat removal system valves remained closed.

The RBIS actuation resulted in the automatic start of the Standby Gas Treatment system (SGTS) trains 'A' and 'B', and automatic closing of the Reactor Building/Secondary Containment system (SCS) trains 'A' and 'B' supply and exhaust ventilation dampers.

At about 1856 hours, the RPS was reset and the RBIS was reset at about 1859 hours and subsequently, the SGTS was returned to normal standby service, and the reactor building ventilation system was returned to service.

CAUSE

The direct cause of the scram signal that initiated the scram was intentionally depressing the manual scram pushbuttons of RPS Channels 'A' and 'B' while at about 43 percent reactor power. This action was taken in accordance with procedure because the AOG system recombiner temperature was greater than 1000 degrees Fahrenheit.

The root cause of the event was failure of PIC-9239 due to inadequate preventive maintenance. Relay K-1 exhibited high contact resistance. This relay functions to determine which signal, manual or automatic, is sent to the operational amplifier of the pressure indicating controller PIC-9239. PIC-9239 functions to control pressure valve PV-9239 that was supplying steam to the AOG preheater and steam dilution flow PCV at the time of the event. The controller was manufactured by the Foxboro Corporation, model 62-HB-4E-OH.

A factor contributing to the cause of the event was no recognition of a degraded material condition or vulnerability of the AOG system to a single component failure (e.g. PIC-9239 or PV-9239).

An additional factor contributing to the event was inadequate communication. A corrective action was not initiated, i.e. a corrective action program document or maintenance document, as a result of not being able to open a hand operated valve (1-HO-154) on or about January 13, 2006. The hand operated valve enables a steam bypass pathway around pressure valve PV-9239. At that time the operator who attempted to open 1-HO-154 mistakenly believed the valve had been successfully opened later in the day on January 13, 2006 and did not initiate a corrective action document (i.e. condition report). This deficient condition was again experienced on March 12th when the AOG system was being put into service. A condition report was initiated prior to the scram, but not until early March 13th. Upon the failure of PIC-9239 on March 13th, valve 1-HO-154 was unable to be opened and the recombiner temperature consequently exceeded 1000 degrees F.

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CORRECTIVE ACTION

Corrective actions taken included the following:

- The 300# pressure indicating controller installed at the time of the event for PV-9239 (Steam heating to Recombiner Preheater) was removed from service and bench tested. Bench testing revealed unacceptable contact resistance in the K-1 relay. A replacement pressure indicating controller (different model number) was obtained from stores, calibrated, bench tested and installed in the field. After installation of the replacement pressure indicating controller, PV-9239 was manually operated and observed to operate as designed.
- The 40# pressure indicating controller installed at the time of the event for PV-9238 (Dilution Steam to Vapor Valves) was removed from service and bench tested. Bench testing revealed unacceptable contact resistance in the K-1 relay. A replacement pressure indicating controller was obtained from stores, calibrated, bench tested, and installed in the field. After installation of the replacement controller, PV-9238 was manually operated and was observed to operate as designed.
- Hand operated valve 1-HO-154 was repaired.
- Night orders were issued to reinforce management expectations for timeliness of initiating corrective action documents for deficient conditions.

Corrective actions planned include the following:

- Develop and implement preventive maintenance for PIC-9239 and PIC-9238. Capture lessons learned from this event in the PM.
- Develop a forced outage work package for replacement of the K-1 relay installed in PIC-9238 and PIC-9239.
- Complete single point vulnerability review, review Scram Frequency Reduction Committee (SRFC) items, and perform a design comparison review for the AOG system.
- Develop a case study from this event and provide training to operations, maintenance, and technical programs personnel.
- Evaluate procedure revisions to allow steam jet air ejector, 300# and 40# regulators with their respective bypass valves throttled to auctioneer steam supplies following the single point vulnerability review.
- Evaluate the AOG system operating procedure to allow bypassing AOG at rated power.
- Perform applicability review for other controllers during development of PMs.

These planned corrective actions may be supplemented or modified in accordance with the corrective action process.

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SAFETY CONSEQUENCES

The Offgas system and AOG system function to process non-condensable offgas resulting from the nuclear fuel fission process. After processing, gases from the Offgas/AOG system are directed to the main stack for release to the environment. The systems each contain separate radiation monitors that monitor the activity of the gases to be released into the atmosphere, and automatically initiate isolation signals to the main stack isolation valve if predetermined setpoints are achieved. The offgases being processed at the time of the event did not exceed the setpoints that would have required the isolation of the main stack isolation valve.

An engineering evaluation was conducted of event parameters related to the AOG system recombiner. The evaluation determined there was no damage to the recombiner vessel.

The decrease in the reactor vessel water level was the expected response to the scram and accompanying shrink in the water. The consequent RPS, PCIS and RBIS actuations were the expected designed responses to a low reactor vessel water level condition, i.e. less than about +12 inches (narrow range).

During the event, the lowest reactor vessel water level that occurred was approximately -21 inches (narrow range). This level is significantly greater than the core standby cooling systems set point (approximately -46 inches), and the level corresponding to the top of the active fuel zone (approximately -127 inches).

All safety systems performed as designed. This event did not result in a challenge to fuel limits or release of radioactive material above the expected normal operating level. The event posed no threat to public health and safety.

REPORTABILITY

This report was submitted in accordance with 10 CFR 50.73(a)(2)(iv) because the actuation of the RPS and consequent actuations of the PCIS and RBIS, although a designed response to intentionally depressing the manual scram pushbuttons of RPS Channels 'A' and 'B' while at about 43 percent reactor power, were not planned.

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station LERs submitted since 2004. The review focused on similarities involving an automatic or manual scram(s) and degrading main condenser vacuum conditions. The review identified no similar events.

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ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS	CODES
Control, indicating, pressure (PIC-9239)	PIC
Recombiner	RCB
Relay (K-1)	RLY
Valve (PV-9239, 1-HO-154)	V

SYSTEMS	CODES
Condenser system	SC
Condenser vacuum system (MCGRS)	SH
Containment isolation control system (PCIS/RBIS)	JM
Engineered safety features actuation system (RPS, PCIS, RBIS)	JE
Offgas system (Offgas, AOG)	WF
Plant protection system (RPS)	JC
Reactor building (SCS)	NG
Reactor recirculation system	AD
Reactor water cleanup system (RWCU)	CE
Standby gas treatment system (SGTS)	BH