Entergy

Entergy Nuclear Operations, Inc.
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Kevin H. Bronson
Site Vice President

February 12, 2009

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 2008-006-00

LETTER NUMBER: 2.09.010

Dear Sir or Madam:

The enclosed Licensee Event Report (LER) 2008-006-00, "Automatic Scram Resulting from Switchyard Breaker Fault during Winter Storm" is submitted in accordance with 10 CFR 50.73.

This letter contains no commitments.

Please do not hesitate to contact Mr. Joseph R. Lynch, (508) 830-8403, if there are any questions regarding this submittal.

Sincerely,

for Kevin H. Bronson

FXM
Enclosure

cc: Mr. James S. Kim, Project Manager
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NRR

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

LICENSEE EVENT REPORT (LER)

Approved by OMB: No. 3150-0104 Expires: 08/31/2010

Estimated burden per response to comply with this mandatory information 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 and information collection does not display a currently valid control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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4. TITLE

Automatic Scram Resulting From Switchyard Breaker Fault During Winter Storm

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE)			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	05000
12	19	2008	2008	006	00	02	12	2009	N/A	05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more)							
N		20.2201(b)		22.2203(a)(3)(i)		50.73(a)(2)(i)(C)	x	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)
10. Power Level		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

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	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
C	FK	52	G080	N					
X	ED	XFMR	Rapid Power Technologies Inc.	Y					

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	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)

On December 19, 2008 at 1831 hours during a severe winter storm an automatic reactor scram occurred with the plant operating at 100% power. The automatic scram initiated from a valid Reactor Protection (RPS) Signal resulting from fast closure of the turbine control valves due to actuation of the main transformer bus differential relay (87B/MT). Automatic response from the main transformer protective relay scheme included opening 345 kV circuit breakers ACB-104 and ACB-105; main turbine trip; and fast transfer of 4.16 kV power from the Unit Auxiliary Transformer (UAT) to the Startup transformer (SUT). The 120 V ac safeguards panels (Y3/31 and Y4/41) de-energized after the UAT to SUT power transfer.

The direct cause of the event was an electrical fault resulting from conductive snow and ice build-up on the non-conductive porcelain surfaces of the ACB-105 "A" phase generator side bushing. The direct cause of power loss to the safeguards panels was high in-rush current and transformer (X55) input breaker trip to Y3/31; and transformer (X56) tap control board malfunction to Y4/41.

Corrective actions were taken to evaluate and assess switchyard circuit breaker and main transformer equipment damage. The bushing on the "A" phase generator side feed on ACB-105 was replaced. The input breaker to X55 and the tap control board to X56 were replaced. Corrective actions planned include analysis of equipment design modifications to reduce flashover and ground fault events in the switchyard. In addition, the input breakers to X55 and X56 will be modified and replaced, and a vendor evaluation of the X56 tap control board will be completed.

The event posed no threat to public health and safety.

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BACKGROUND

During normal power operation the station main generator provides power through the isolated phase bus at 24 kV to both the main transformer and the unit auxiliary transformer (UAT). The generator voltage is stepped up through the main transformer to 345 kV and power flows into the ring bus in the switchyard to the New England power grid over the two (2) 345 kV transmission lines connected to the ring bus.

The 345 kV ring bus is located in a switchyard adjacent to the station. The 345 kV ring bus is connected to the following:

1. Station main transformer and UAT
2. One 345 kV transmission line, Line-342
3. Station startup transformer (SUT)
4. One 345 kV transmission line, Line-355.

There are four (4) 345 kV circuit breakers provided in the ring bus, ACB-102, ACB-103, ACB-104 and ACB-105.

Protective relaying, as it pertains to the 345 KV switchyard is designed to isolate faults as quickly as possible and with as little impact on the transmission system as possible. The protective relays scheme has four protection areas. These areas are:

- The main generator, main transformer and unit auxiliary transformer (protected by ACB-104 and ACB-105)
- The startup transformer (protected by ACB-102 and ACB-103)
- Line-355 (protected by ACB-102 and ACB-105)
- Line-342 (protected by ACB-103 and ACB-104)

If the protection scheme for the main generator, main transformer, and UAT actuates, ACB-104 and ACB-105 automatically open to isolate the main transformer from the switchyard. This results in a generator load rejection event and resultant automatic opening of the main generator field breakers, main turbine trip, reactor scram, and fast transfer of station power from the UAT to the SUT.

The Auxiliary Power Distribution System (APDS) distributes alternating power (ac) to station auxiliaries needed for normal plant operation and to emergency equipment needed for safe shutdown. The APDS consists of six (6) 4.16 kV buses (A1, A2, A3, A4, A5 and A6). During normal operation, the UAT provides power to the 4.16 kV buses. Automatic fast transfer from the UAT to the SUT is provided to restore each 4.16 kV bus when the UAT loses power. Buses A5 and A6 provide power to the "emergency services" portion of the system. The standby emergency diesel generators (EDGs) can be aligned to provide power to the A5 and A6 buses.

The 120V ac safeguards subsystem distributes ac power to instrumentation and control loads essential to plant safety. These redundant panels provide power to torus and drywell instrumentation; radiation effluent monitors; and specific safety system logic including Salt Service Water (SSW) and Reactor Building Closed Cooling Water System (RBCCW). Safeguards panels Y3/31 and Y4/41 receive power from the "emergency services" portion of the APDS System.

On December 19, 2008, plant conditions included the following: The reactor mode selector switch was in the RUN position and the reactor was operating at 100 percent power. The reactor vessel pressure was approximately 1028 psig with the reactor water at the saturation temperature for that pressure. The reactor vessel water level was +28" (narrow range) and reactor core flow was approximately 59.5 E+06 pounds per hour. All ACBs in the ring bus were closed and the UAT was providing power to APDS system.

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EVENT DESCRIPTION

On December 19, 2008, at 1831 hours, an unplanned automatic reactor protection system scram signal and scram occurred while operating at approximately 100% power. The event occurred with a severe winter storm in progress with predominantly easterly winds and snow depositing at a rate of approximately one (1") inch per hour.

A significant current to ground fault on ACB 105 actuated the main transformer bus differential relay (87B/MT). In accordance with design, this energized the main transformer lockout relay (86X/MT) and automatically opened ACB-104 and ACB-105, automatically opened the main generator field breaker, automatically tripped the main turbine, and automatically fast transferred APDS 4.16 kV power from the UAT to the SUT. The turbine trip caused fast closure of the turbine control valves and automatic reactor scram. Withdrawn controls rods rapidly inserted.

The ground fault on ACB-105 was significant and was also seen by the Line-355 protective relays. In accordance with design, this automatically opened ACB-102 and ACB-105. ACB-102 automatically re-closed after sensing that the Line-355 fault cleared. ACB-103 was not affected and provided offsite power via Line-342 to the SUT throughout the event.

The turbine trip resulted in automatic closing of the turbine control valves and stop valves. Three (3) turbine steam bypass valves opened to divert steam flow to the main condenser. These turbine steam bypass valves have a capacity for diverting 25% of the rated steam flow. In accordance with the analyzed transient analysis for a load reject event, reactor pressure increased and three (3) of the four (4) main steam relief valves (MSRVs) opened when mechanical set pressure was exceeded. The MSRVs reset and long term reactor pressure control was accomplished using the turbine steam bypass valves.

The initial reactor vessel pressure increase contributed to a decrease in the reactor water void fraction (shrink). The decrease in the void fraction resulted in a decrease in the reactor water level to about –5" (narrow range). This level is less than the low water level setting (+12" narrow range) for automatic actuation of the Primary Containment Isolation Control System (PCIS) Group II (Sampling System); and automatic actuation of PCIS Group VI (Reactor Water Cleanup System) and the Reactor Building Isolation Control System (RBIS). As expected, PCIS and RBIS systems automatically actuated. Reactor water level was restored to the normal level (~29") using the normal condensate and feedwater systems. All transient parameters were consistent with the existing transient analysis.

The station APDS 4.16 kV ac power buses were fast transferred from the UAT to the SUT in accordance with design. Offsite power via ACB-103 and Line-342 to the SUT was maintained. Due to operational concerns for potential grid instability, the standby EDGs were manually started and aligned to provide power to the A5 and A6 4.16 kV emergency services buses at 1852 hours.

When 4.16 kV ac power fast transferred over to the SUT, the 120 V ac safeguards instrumentation panels (Y3/31 and Y4/41) lost power. This loss of power was not in accordance with design. Operator actions defined in site procedures were taken to restore power by 1850 hours (panels were lost for ~19 minutes).

The NRC Operations Center was notified of the event via Event # 44735 in accordance with 10 CFR 50.72 at 21:52 hours on December 19, 2008.

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CAUSE

The direct cause of the automatic reactor scram was reactor protection system actuation resulting from fast closure of the turbine control valves.

The root cause of the event was ice and snow build up on ACB-105 "A" phase bushing on the main transformer side and flashover which resulted in a significant current to ground fault. ACB-105 is an ac circuit breaker; model number HVB-SF6, manufactured by the General Electric–Hitachi company.

The direct cause of power loss to the safeguards panels was high in-rush current and transformer X55 input breaker trip; and transformer X56 tap control board malfunction. The X55 and X56 transformers are 480 V ac to 120 V ac transformers, model number PWTAB015120E, manufactured by Rapid Power Technologies Incorporated.

CORRECTIVE ACTION

Corrective actions taken included the following:

- Performed a post scram walk down of the switchyard and testing to assess ACB, main transformer, and UAT equipment damage.
- An elevated monitoring plan was established and implemented on the main transformer.
- The "A" phase bushing on ACB-105 (main transformer side) was damaged due to the ground fault. Switchyard breakers were aligned with ACB-105 open to allow reactor start and plant generation. The plant was synchronized to the power grid on 12/23/08. The damaged bushing on ACB-105 was replaced on 12/29/08, ACB-105 was returned to service on 12/30/2008.
- Power was restored to the 120 V ac safeguards panels during the scram event.
- The input breaker to the X55 transformer feed to Y3/31 was replaced.
- The transformer tap control board was replaced on the X56 transformer feed to Y4/41.

Corrective actions planned include the following:

- Review of potential design changes to improve switchyard resistance to weather related flashovers.
- Modify and replace the input breakers on the X55 and X56 transformers.
- Complete vendor evaluation of transformer tap control board failure.

Results of these corrective actions will be tracked in the Corrective Action Program (see CR-PNP-2008-3962 and 3963).

SAFETY CONSEQUENCES

The event posed no threat to public health and safety.

The turbine trip system is non-safety related. A turbine trip is a transient that the plant is designed to experience without safety consequence. A turbine trip at greater than 25% rated power is expected to result in a reactor scram due to actuation of the RPS logic on a fast closure of the turbine control valves signal.

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The load rejection and reactor scram experienced during this event is bounded by the transient analysis described in the Updated Final Safety Analysis Report (UFSAR) Section 14.4.3, "Generator Load Reject without Bypass." At the on-set of the event, the initial pressure rise and opening of some or all of the MSRVs is an expected response to fast closure of the turbine control valves when operating at 100%. During the transient three of the four MSRVs automatically opened on mechanical overpressure (nominal set-point between 1095 and 1115 psig +/- 11 psi) in accordance with design to relieve reactor pressure. The turbine steam bypass valves also opened per design and relieved reactor pressure to the main condenser. The main steam safety valves (set-point is 1240 psig +/-113 psi) did not open during the event.

Reactor water level was maintained within the limits expected for the event. Reactor water level decreased to approximately - 5" (narrow range). This level is below the setpoint (+12") for actuation of the primary containment isolation system (PCIS) for Group II (sample valves) and for actuation of PCIS Group VI (Reactor Water Cleanup System) and the Reactor Building Isolation System (RBIS). These systems actuated and operated as designed in response to the low water level condition. Reactor water level was recovered using the normal condensate and feedwater systems and maintained at the normal operating level (~29"). Reactor water level was maintained well above the set-point limit for automatic actuation of the Core Standby Cooling Systems and Group I portion of the PCIS (about -46"), and well above the level corresponding to the top of the active fuel (about -127").

Offsite power was maintained to the 4.16 kV ac emergency and normal service buses. The standby EDGs and Station Blackout Diesel Generator were available. In response to grid stability concerns, safety related 4.16 kV buses A5 and A6 were conservatively placed on the EDGs. The Core Standby Cooling Systems (HPCI System, Automatic Depressurization System, Residual Heat Removal System, and Core Spray System) and the RCIC System were available but were not operated during the event.

The loss of the Y3/31 and Y4/41 120 V ac safeguards panels for approximately 19 minutes during the scram event was not expected. However, plant shutdown was not jeopardized by the loss of these panels. The Pilgrim Station electrical design relies on power restoration to the A5 and A6 4.16 kV buses within 13 seconds for a design basis event involving a loss of offsite power and loss of coolant accident. During the scram event, when the safeguards panels were de-energized, the SSW Loop 'A' and 'B' pumps and RBCCW Loop 'A' and 'B' pumps were not capable of automatically starting as assumed in the design. The manual start function of the pumps was not affected. The significance of losing power to the safeguards panels during a load reject scram was assessed. The assessment revealed that the loss of the panels is detectable and that actions to re-energize the panels are addressed in plant procedures. In addition, capability to manually start the SSW and RBCCW pumps was maintained. A risk assessment identified that the Incremental Conditional Core Damage Probability (ICCDP) and the Incremental Conditional Large Early Release Probability (ICLERP) resulting from loss of Y3/31 and Y4/41 during the event was insignificant.

No fuel, reactor, or pressure boundary safety limits were challenged by this event.

REPORTABILITY

This report was submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A) and 50.73(a)(2)(vii).

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SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station LERs since 1974. The review identified a number of similar events which involved switchyard electrical faults resulting in load rejection and reactor scram. LERs 1985-025, 1992-016, 1993-004, and 1993-022 identify events where reactor scram occurred due to the effects of severe weather events including lightning strikes and winter storms. LER 2003-003 identifies an event where a fault on the UAT resulted in load rejection and reactor scram.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS	CODES
Breaker, AC	52
Relay, Differential, Protective	87
Relay, Lock-Out	86
Transformer (Main, 480 to 120 V ac)	XFMR
Tap Changer, Transformer	TTC

SYSTEMS	CODES
Switchyard System	FK
Engineered Safety Features Actuation (RPS, PCIS, RBIS)	JE
Containment Isolation Control System (PCIS, RBIS)	JM
Main Generator Output Power System	EL
Medium Voltage Power System – Class 1E (4 kV)	EB
Low Voltage Power – Class 1E (120 V safeguards)	ED