Exelon.
Nuclear

Clinton Power Station
8401 Power Road
Clinton, IL 61727-9351

10 CFR 50.73
SRRS 5A.108
March 23, 2011
U-604009

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Licensee Event Report 2009-005-01

Enclosed is Licensee Event Report (LER) No. 2009-005-01: Manual Scram on High Water Level Due to Reactor Recirc Pump Trip. This report is being submitted in accordance with the requirements of 10 CFR 50.73.

The enclosed report is revised to update the cause for the reactor water level control issue.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this report, please contact Mr. A. Khanifar at (217)-937-3800.

Respectfully,

F. A. Kearney
Site Vice President
Clinton Power Station

RSF/blf

Enclosures: Licensee Event Report 2009-005-01

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety – IEMA Division of Nuclear Safety

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NRR

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

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Clinton Power Station, Unit 1	05000461	1 OF 4

4. TITLE
Manual Scram on High Water Level Due to Reactor Recirc Pump Trip

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 05000
10	15	09	2009	005 -	01	03	23	2011	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE: 1

10. POWER LEVEL: 96.6

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)*
A. Khanifar, Site Engineering Director	(217) 937-3800

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
X	AD	MO	G080	Y					

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)*	☒ NO				

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

On 10/15/09 the 'B' Reactor Recirculation (RR) Pump unexpectedly tripped from fast speed to off. Reactor Pressure Vessel (RPV) water level increased and operators placed the Reactor Mode Switch in Shutdown at a predetermined level prior to the high reactor vessel water level automatic scram setpoint. All control rods fully inserted. When RPV water level decreased below the low RPV water level setpoint, operators entered Emergency Operating Procedure (EOP) 1, RPV Level Control. The cause of this event is attributed to failure of the 'B' RR pump motor. Vendor failure analysis concluded that the failure in the RR pump motor was a B-Phase turn-to-turn fault located at a connection end coil knuckle. The failure was limited to a single coil end turn knuckle of the winding and was located in a position that is not susceptible to air flow or foreign material. The apparent cause of the failure was a random insulation breakdown of the original winding that resulted in a turn-to-turn failure. The pump motor that failed has been replaced by a spare pump motor and the motor that failed was shipped to a vendor for failure analysis and repair.

NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

General Electric – Boiling Water Reactor, 3473 Megawatts Thermal Rated Core Power

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

EVENT IDENTIFICATION

Manual Scram on High Water Level Due to Reactor Recirc Pump Trip

A. CONDITION PRIOR TO EVENT

Unit: 1	Event Date: 10/15/09	Event Time: 0538 hours CST
Reactor Mode: 1	Mode Name: Power Operation	Power Level: 96.6 percent

B. DESCRIPTION OF EVENT

On 10/15/09 at 0537 hours, operators in the Main Control Room (MCR) received an alarm [ALM] indicating the 'B' Reactor Recirculation (RR) [AD] Pump [P] had unexpectedly tripped from fast speed to off. The 'A' Reactor Recirculation Pump remained in fast speed. The trip of 'B' Reactor Recirculation Pump caused Reactor Pressure Vessel (RPV) water level to increase, and the high RPV water level alarm annunciated.

At 0538 hours, with RPV water level increasing to the predetermined level of 48 inches, operators responded as expected by placing the Reactor Mode Switch [HS] into the Shutdown position to initiate a manual reactor scram prior to the high RPV water Level 8 reactor scram setpoint of 52.0 inches. All control rods fully inserted as a result of the manual reactor scram. Immediately after the scram RPV water level decreased below the low RPV water Level 3 setpoint as expected and operators responded by entering Emergency Operating Procedure (EOP) 1, RPV Level Control.

As expected, the low RPV water Level 3 trip caused primary containment isolation valves [ISV] in Group 2 (Residual Heat Removal (RHR) [BO]), Group 3 (RHR), and Group 20 (miscellaneous systems) to receive signals to shut; operators verified that the containment isolation valves properly responded to the Level 3 trip.

At 0556, plant conditions were stable with RPV water level above the level 3 trip setpoint and the reactor scram was reset.

At 0558 hours, operators were unable to fully shut Main Steam [SB] to Moisture Separator Reheater inlet valves 1B21F302A and 1B21F500A resulting in reactor vessel cooldown rates challenging the prescribed pressure band. As a result, operators manually shut the Main Steam Isolation Valves to maintain reactor vessel cooldown rates within limits. Main Steam Line drains were used to control reactor pressure. Issue Report 979911 was initiated to investigate and correct the failure of these valves to shut.

At 0717 hours, operators started the 'B' Residual Heat Removal system in suppression pool cooling mode to support running the Reactor Core Isolation Cooling (RCIC) system [BN] in the pressure control mode. At

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0725 hours, operators started the RCIC system in the tank to tank mode to supplement reactor pressure control.

At about 0927 hours, operators exited EOP-1.

Initial investigation at the 3B and 4B feed breakers [BKR] for the 'B' RR pump motor [MO] revealed that the ground relays [64] had actuated on both breakers. Further troubleshooting and megger testing of the motor determined the cause of 'B' Reactor Recirculation pump trip was a phase to ground fault inside the pump motor. The motor has been sent to a vendor for failure analysis.

Upon trip of the 'B' RR pump, an immediate operator action is to shut the RR pump discharge valve for the idle reactor recirculation pump to prevent reverse rotation of the pump. During this event, operators attempted to close the 'B' RR pump discharge valve, 1B33F067B, but it would not fully close. Issue Report 979732 was initiated to investigate and correct the failure of valve 1B33F067B to fully close.

No other inoperable equipment or components directly affected this event.

Issue Report 979700 was initiated to investigate this event and initiate corrective actions.

The NRC Operations Center was notified at 0806 hours about this reactor scram via Event Notification number 45433.

C. CAUSE OF EVENT

The cause of this event is attributed to the failure of the 'B' RR pump motor. The pump motor was shipped to a vendor for failure analysis. The vendor concluded that the failure in the RR pump motor was a B-Phase turn-to-turn fault located at a connection end coil knuckle. The failure was limited to a single coil end turn knuckle of the winding and was located in a position that is not susceptible to air flow or foreign material. The affected area was cut out and the remaining windings passed all electrical testing. The apparent cause of the failure was a random insulation breakdown of the original winding that resulted in a turn-to-turn failure.

Clinton Power Station is designed to stay on line with a single recirculation pump trip. A review of the response of the Feedwater Level Control System (FWLCS) [JB] to the 'B' RR Pump trip on 10/15/09 identified that it was very similar to that of a previous event on 2/10/08 when the 'B' RR Pump tripped to off and an unexpected reactor scram occurred on high RPV water Level 8.

The cause of the 2/10/08 Reactor Scram identified that FWLCS tuning was inadequate to ensure that Reactor water level does not approach the Level 8 Scram setpoint when a single RR pump trips off. Specifically, the FWLCS flow controllers were not properly tuned to provide adequate margin to the high water Level 8 scram setpoints. Consequently, the feedwater demand signal did not decrease fast enough to reduce feedwater pump flow after the RR pump trip. In response to the cause an action plan was developed to correct the plant response to a single RR pump trip including dynamic tuning of the FWLCS. At the time of this 10/15/09 event, all of the actions were not completed from the 2/10/08 event but were completed during startup from refueling outage C1R12 in February 2010.

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D. SAFETY CONSEQUENCES

This event is reportable under the provisions of 10 CFR 50.73 (a) (2) (iv) (A) as an event that resulted in a manual reactor scram while the reactor was critical. No significant safety consequences resulted from this event because required safety systems were available and functioned as designed within safety limits. The reactor was shut down safely and maintained in a safe shut down condition.

This reactor scram event was compared to similar previous events and the plant response and behavior was almost identical to the previous events. The reactor scram was compared to Updated Safety Analysis Report (USAR) Section 15.3, Decrease in Reactor Coolant System Flow Rate. The fission product barriers (fuel clad, reactor, pressure boundary, containment) were not challenged during this event. No Safety Relief Valves lifted during this event and pressure control maintained by Main Steam Line Drains and the RCIC system. The Motor Driven Reactor Feed Pump was used to maintain RPV water level.

This event report does not identify any safety system functional failures.

E. CORRECTIVE ACTIONS

A spare RR pump motor was installed in place of the 'B' RR pump motor that failed. The 'B' RR pump motor that failed has been repaired.

Final tuning of the FWLCS was completed prior to and during refueling outage C1R12.

F. PREVIOUS OCCURRENCES

LER 2008-001 was a previous similar event. A reactor scram event occurred on 2/10/08 as a result of an unexpected trip of the 'B' RR pump. This event is discussed further in the CAUSE OF EVENT section of this report.

G. COMPONENT FAILURE DATA

The Reactor Recirculation Pump B motor was manufactured by General Electric, and is 6300 horsepower, 6600 volts, 484 amps, 3-phase, non-safety, Critical Class 1, continuous run motor, model 264X805.