Clinton Power Station
8401 Power Road
Clinton, IL 61727

U-604091
August 6, 2012

10 CFR 50.73
SRRS 5A.108

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 2011-008-01

Enclosed is Licensee Event Report (LER) No. 2011-008-01: Reactor Protection System Actuation And Loss Of Shutdown Cooling. This revised report is being submitted in accordance with the requirements of 10 CFR 50.73.

There are no regulatory commitments contained in this report.

Should you have any questions concerning this report, please contact J. E. Cunningham, at (217) 937-2200.

Respectfully,

William G. Noll
Site Vice President
Clinton Power Station

RSF/blf

Enclosure: Licensee Event Report 2011-008-01

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

IE22
NRR

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 Section (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)

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

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4. TITLE

Reactor Protection System Actuation And Loss Of Shutdown Cooling

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
									N/A	N/A
12	18	2011	2011	- 008 -	01	08	06	2012	FACILITY NAME: N/A	DOCKET NUMBER: N/A

9. OPERATING MODE

4

10. POWER LEVEL

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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)*
J. E. Cunningham, Director Site Operations	(217) 937-2200

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 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 12/18/11, the plant was in Cold Shutdown conducting restoration activities following the Reactor Pressure Vessel (RPV) hydrostatic pressure test. While lowering RPV water level to a target level, a low RPV water level (Level 3) reactor protection system actuation occurred resulting in a residual heat removal (RHR) system isolation, and a subsequent loss of shutdown cooling. RPV water level was immediately restored above the Level 3 setpoint using the control rod drive system. Operators reset the RHR isolation logic within minutes of the scram signal, and shutdown cooling was fully restored in 26 minutes. Reactor coolant temperature increased approximately three degrees Fahrenheit during this event. The causes of this event were lack of rigorous process controls while removing and installing the permanent shutdown and upset level instruments reference leg pipe and not having an alternate for shutdown range level indication to allow monitoring reactor water level during times when the shutdown and upset level instruments are not in service. Corrective actions include revising the procedure to control the entire evolution of shutdown and upset level instruments reference leg pipe reassembly and recovery of vessel level indication, and developing an alternate method for determining RPV level during shutdown conditions.

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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

Reactor Protection System Actuation And Loss Of Shutdown Cooling

A. Plant Operating Conditions Before the Event

Unit: 1 Event Date: 12/18/11 Event Time: 0930 hours CST
Mode: 4 Mode Name: Cold Shutdown Reactor Power: 0 percent

B. DESCRIPTION OF EVENT

On 12/18/2011, Clinton Power Station (CPS) was in Mode 4 (Cold Shutdown), conducting restoration activities following the Reactor Pressure Vessel [RPV] hydrostatic pressure test. While Operations was lowering reactor water level to a target RPV water level, a low RPV water level (Level 3) reactor protection system actuation occurred resulting in a residual heat removal (RHR) [BO] system isolation, and a subsequent loss of shutdown cooling (SDC). RPV water level was immediately restored above the Level 3 setpoint using the control rod drive system CRD [AA]. Operators reset the RHR isolation logic within minutes of the scram signal, and shutdown cooling was fully restored in 26 minutes.

Following completion of the RPV pressure testing, at about 0700 on 12/18/11, Operations set the target RPV water level to be below the Main Steam [SB] lines in accordance with procedure, at a normal Mode 4 level of between +75 inches and +95 inches as indicated on the shutdown range indication. A Reactor Operator was assigned responsibility for RPV water level and was monitoring Reactor Water Cleanup (RWCU) [CE] reject rate which was set to achieve an approximately one inch per minute decrease in RPV water level. Operators were monitoring RPV water level on a recorder [LR] and a large screen in the Main Control Room (MCR) using the shutdown range RPV water level instrument output, as well as the upset range level instrument.

At about 0930, during the evolution to lower RPV water level, the Low RPV Water (Level 3) trip setpoint (+8.9 inches) was reached which initiated reactor protection system and containment isolation signals, resulting in automatic closure of the Division 1 SDC suction containment isolation valves [ISV] and a loss of SDC RHR Train A. Since the reactor was in Mode 4 prior to the actuation, no control rod motion occurred as all control rods were fully inserted. At the time of the actuation, the shutdown range water level instruments read +116 inches and the upset range water level instruments read +145 inches. The other normally available RPV water level instruments are narrow range and wide range, which all have a maximum range of +60 inches. The narrow range instruments were unavailable during this event due to ongoing maintenance activities.

Review of computer points following the event found the wide range water level instruments came on scale at +59 inches four minutes prior to the actuation, and the wide range water level instruments read +57 inches when the actuation occurred.

Following the Level 3 trip, the MCR crew completed the immediate and subsequent actions for a reactor scram, entered off-normal procedures for reactor scram, automatic isolation, and loss of shutdown cooling, and commenced recovery of shutdown cooling. The Level 3 condition cleared within seconds as the CRD system

commenced injecting approximately 200 gallons of water per minute into the RPV. Operators reset the RHR system isolation signal, allowing the operators to reopen the Shutdown Cooling containment isolation valves. Approximately five minutes after the initial actuation, Operations directed an extra Reactor Operator in the control room to obtain readings from the Analog Trip Modules for the transmitters which are used in the Level 3 actuation and containment isolation logic. At that time, the readings for all four divisions of RPV water level indication were nominally +24 inches and trending up. After the Level 3 actuation, Operations ordered a rising trend on Shutdown Range and shortly thereafter, provided a level band of +130 to +150 inches Shutdown Range. At about 0956, operators restored RHR SDC Train A. During the period of time shutdown cooling was not in service, reactor coolant temperature increased approximately three degrees Fahrenheit (F).

RR Pump A remained in operation in low speed throughout this event so forced cooling of the reactor core was not lost. RWCU System Train A also remained in operation throughout the event.

Following recovery of shutdown cooling, the Operations crew recognized that the vessel indicated level was higher than actual vessel level due to an incompletely filled reference leg for the shutdown and upset level instruments reference leg pipe. Maintenance was contacted to re-perform the fill of the shutdown and upset level instruments reference leg pipe. After the reference leg pipe fill was completed at 1253 hours, RPV shutdown level indication lowered 109 inches from +195 inches to +86 inches as indicated on the shutdown instrument. This was determined to be the amount of level error due to the initial incompletely filled shutdown and upset level instruments reference leg pipe.

There were no structures, systems, or components that were inoperable at the start of the event that contributed to this event.

This event was an 8-hour reportable event under 10 CFR 50.72 (b)(3)(iv)(A) as a valid actuation of the Reactor Protection System [JC] and 10 CFR 50.72(b)(3)(v)(B) as an event that at the time of discovery could have prevented the fulfillment of a safety function needed to remove residual heat. (Completed Event Notification 47533)

This event is also reportable under the provisions of 10 CFR 50.73 (a)(2)(iv)(A) due to a valid actuation of the Reactor Protection System [JC] and 10 CFR 50.73(a)(2)(v)(B) as an event that could have prevented the fulfillment of the safety function of structures or systems that are needed to remove residual heat. Issue Report 1304323 was initiated to investigate this event.

C. CAUSE OF EVENT

The cause evaluation for this event identified two root causes, one cause was the lack of rigorous process controls while removing and installing the permanent shutdown and upset level instruments reference leg pipe, specifically, instructions on how to fill the shutdown and upset level instruments reference leg pipe were inadequate and there was insufficient guidance on how to perform a check of the restored instrument. The second cause was the station did not have an alternate for shutdown range level indication to allow monitoring reactor water level during times when the shutdown and upset level instruments are not in service.

D. SAFETY CONSEQUENCES

The risk associated with losing SDC in Mode 4 is the loss of a key system used to remove decay heat from the RPV while shutdown. While there are other methods of decay heat removal, the primary method is the SDC mode of RHR, which is a significant contributor to risk reduction. With the loss of SDC, the temperature of the

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NARRATIVE

RPV coolant will begin to rise and there is a potential for an unplanned entry into Mode 3 (Hot Shutdown) condition.

All control rods were fully inserted prior to the event thus the generation of the Low RPV Water Level 3 signal had no impact on plant status. The SDC system was restored immediately after the event as reactor water level was restored above the Level 3 setpoint using the CRD system. The operators reset the logic within minutes of the scram signal, and cooling was fully restored in 26 minutes. Reactor coolant temperature increased approximately three degrees F.

Since RPV level was immediately restored above the Low RPV Water Level 3 scram setpoint following the scram; the RHR isolation signal was available to be reset; thus, both RHR SDC loops were always available for Shutdown Cooling.

E. CORRECTIVE ACTIONS

Procedure CPS 3007.01, Preparation and Recovery from Refueling Operation, has been revised to provide controls for the entire evolution of transitioning shutdown and upset level instruments reference leg pipe from permanent to temporary and back to permanent instrumentation.

An alternate method will be developed for determining RPV level during shutdown conditions or maintaining shutdown instrumentation available during RPV disassembly / re-assembly.

F. PREVIOUS OCCURRENCES

The station issued LER 2004-004, Reactor Scram While Placing Residual Heat Removal B into Shutdown Cooling, involving a Level 3 isolation and loss of SDC in July 2004. The 2004 event and this December 2011 event both had issues with communications, the 2004 issues led to inadequate resolution of conflicting indication prior to proceeding, but in the December 2011 event, Operations did not proceed until they were given assurances that the RPV water level indication was technically validated and accurate after the second fill and vent of the reference leg.

G. COMPONENT FAILURE DATA

None