



Clinton Power Station  
8401 Power Road  
Clinton, IL 61727

U-604126  
June 24, 2013

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 2013-003-00

Enclosed is Licensee Event Report (LER) No. 2013-003-00: Manual Reactor SCRAM Due To Main Electro-Hydraulic Control System Failure. This 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 Ms. Kathy Ann Baker, Regulatory Assurance Manager, at (217)-937-2800.

Respectfully,

A handwritten signature in black ink, appearing to read "W. G. Noll", written in a cursive style.

William G. Noll  
Site Vice President  
Clinton Power Station

RSF/blf

Enclosures: Licensee Event Report 2013-003-00

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

Handwritten initials "J E 22" above "NRC" in black ink.

# LICENSEE EVENT REPORT (LER)

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

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.

1. FACILITY NAME Clinton Power Station, Unit 1	2. DOCKET NUMBER 05000461	3. PAGE 1 OF 4
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4. TITLE  
Manual Reactor SCRAM Due To Main Electro-Hydraulic Control System Failure

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
04	26	2013	2013	- 003	- 00	06	24	2013		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE  1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
10. POWER LEVEL  097	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME Kathy Ann Baker, Regulatory Assurance Manager	TELEPHONE NUMBER (Include Area Code) 217-937-2800
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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
D	TG	SHV	G080	Y					

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE		
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO				MONTH	DAY	YEAR

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

On 4/26/13, with the plant at 97 percent power, the Main Control Room received a Main Electro-Hydraulic Control (EHC) pressure alarm due to lowering level in the EHC Oil Reservoir. An operator reported Main EHC Oil Reservoir level was at minus 4.25 inches and rapidly lowering. In response, Operators initiated a manual reactor SCRAM. All control rods fully inserted and the plant responded as expected to the SCRAM. The EHC oil leak was caused by a broken socket head cap screw used to attach a hydraulic shutoff valve to a Main Steam Turbine Control Valve and three remaining cap screws were loose, with one slightly bent. The faulty shutoff valve was replaced, properly torqued, and the EHC system was pressurized to verify it was free of leaks. The bolting torque was verified to be proper for all hydraulic shutoff valves for control valves, stop valves, and intermediate valves. The most probable cause for this event is inadequate work instructions that led to failure to install appropriate lock washers on the shutoff valve connection, resulting in cap screws becoming loose and ultimately failing due to fatigue. Corrective action includes correcting work instructions, initiating work orders to install lock washers on hydraulic shutoff valves, and ensuring the bill of materials in model work orders specifies the appropriate lock washers for the application.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Clinton Power Station, Unit 1	05000461	YEAR	SEQUENTIAL NUMBER	REV NO.	2 OF 4
		2013	- 003	- 00	

**NARRATIVE**

**PLANT AND SYSTEM IDENTIFICATION**

General Electric -- Boiling Water Reactor, 3473 Megawatts Thermal Rated Core Power Energy Industry Identification System (EIS) codes are identified in test as [XX].

**EVENT IDENTIFICATION**

Manual Reactor SCRAM Due To Main Electro-Hydraulic Control System Failure

**A. Plant Operating Conditions Before the Event**

Unit: 1                      Event Date: 4/26/13                      Event Time: 0855 hours CDT  
 Mode: 1                      Mode Name: Power Operation                      Reactor Power: 97 percent

**B. DESCRIPTION OF EVENT**

On 4/26/13, the plant was in Mode 1 (Power Operation) at 97 percent power. At 0855 hours, operators in the Main Control Room received a Main Electro-Hydraulic Control (EHC) [TG] pressure alarm [ALM] due to lowering level in the EHC oil reservoir [RVR]. A non-licensed operator was dispatched to the EHC skid to investigate the alarm. The operator reported that the main EHC oil reservoir level was at minus 4.25 inches and rapidly lowering. An oil mist was reported on the 800-foot elevation of the Turbine Building. In response to these conditions, operators initiated a manual reactor SCRAM by placing the reactor mode switch [HS] in the shutdown position. Operators entered the Reactor Scram Off-Normal procedure and subsequently entered Emergency Operating Procedure (EOP) -1, "Reactor Pressure Vessel Control," due to an expected low reactor water Level 3 trip signal. All control rods fully inserted and the plant responded as expected to the SCRAM. Operators evaluated the need to enter Emergency Action Levels (EALs) and concluded that no entry thresholds were met. Operators controlled reactor pressure using Turbine bypass controls which were unaffected by the EHC failure.

At 1100 hours, Operators exited EOP-1 in accordance with normal plant procedures as stable plant conditions were reached. Operators maintained the reactor in Mode 3, Hot Shutdown.

As expected during the event, when reactor water level lowered to the low reactor water Level 3 trip setpoint primary containment isolation valves [ISV] in Group 2 (Residual Heat Removal (RHR) [BO]), Group 3 (RHR), and Group 20 (miscellaneous systems) received signals to automatically shut; these valves are normally closed and operators verified that the valves remained in the closed position.

Following the reactor scram, a walkdown by Mechanical Maintenance personnel identified the cause of the EHC oil leak as a broken socket head cap screw that was used to attach a hydraulic shutoff valve [SHV] to Main Steam Turbine Control Valve Number 4 (1TGCV4). Maintenance personnel found the three remaining cap screws on the shutoff valve loose, with one of the three slightly bent.

This event was determined to be reportable under the provisions of 10 CFR 50.73(a)(2)(iv), as a condition that resulted in manual actuation of the reactor protection system (RPS). The station notified the NRC of this event via Emergency Notification 48974 at 1155 hours on 4/26/13. Issue Report 1506929 was initiated to investigate this event.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Clinton Power Station, Unit 1	05000461	YEAR	SEQUENTIAL NUMBER	REV NO.	3 OF 4	
		2013	- 003	- 00		

**NARRATIVE**

**C. CAUSE OF EVENT**

The cause analysis identified that the most probable cause for this event was inadequate work instructions in the 2008 work order that led to a failure to install appropriate lock washers on the shutoff valve connection to Main Steam Turbine Control Valve Number 4, resulting in the socket head cap screws becoming loose due to the dynamic service loading on the shutoff valve connection over the five years since installation, ultimately failing due to fatigue.

A contributing cause for this event is the mounting bolt installation kits for the shutoff valves came with the cap screws but did not have any lock washers for the shutoff valve connection. This may have led the installer to assume the kit was complete with all parts needed to install (i.e., human error trap).

**D. SAFETY CONSEQUENCES**

The actuation of the Reactor Protection System placed the plant in a safe and stable condition. There were no plant safety limits exceeded, and no other Engineered Safety Feature actuations, and risk significance was low. Safety-related systems functioned correctly in response to this event with critical plant parameters remaining within the bounds of plant design, Technical Specifications, Updated Safety Analysis Report, Offsite Dose Calculation Manual, and Core Operating Limits Report. The affected system (i.e., TG system) is not-safety related.

No loss of safety function occurred during this event.

**E. CORRECTIVE ACTIONS**

The hydraulic shutoff valve on Control Valve 1TGCV4 and its associated cap screws were replaced and torqued to the required 25 foot-pounds, and the EHC system was pressurized to verify it was free of leaks.

As an extent of condition review, the bolting torque for all hydraulic shutoff valves for turbine control valves, stop valves, and intermediate valves was verified to be at the proper torque value of 25 foot-pounds.

Work Orders are being created to install lock washers during the next refueling outage on the shutoff valve for 1TGCV4 and, as part of the extent of condition review, on the shutoff valve for turbine control valve number 2 (1TGCV2) which was also found without lock washers. The other turbine control valves (1TGCV1 and 1TGCV3) were found to have the required lock washers installed.

The model work order for replacing shutoff valves on control valves will be revised to add shutoff valve Original Equipment Manufacturer (OEM) installation requirements including job steps to validate that the proper lock washers have been installed.

A review of the model work orders used to install the hydraulic shutoff valves on the turbine control valves and combined intermediate valves was performed and found that the work orders included specific steps to install the lock washers. However, work orders will be created to validate lock washers are installed on all hydraulic shutoff valves on main steam valves.

The station will ensure the bill of materials in model work orders for installing shutoff valves on control valves specifies the appropriate lock washers for the application.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Clinton Power Station, Unit 1	05000461	YEAR	SEQUENTIAL NUMBER	REV NO.	4 OF 4
		2013	- 003	- 00	

**NARRATIVE**

**F. PREVIOUS OCCURRENCES**

A review for previous occurrences did not identify similar events at Clinton Power Station.

**G. COMPONENT FAILURE DATA**

Component Description: Stainless steel shut-off valve for EHC System on main turbine steam valves  
Manufacturer: General Electric Company  
Manufacturer Part Number: 0843E704G0003