



An Exelon/British Energy Company

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**Clinton Power Station**

R.R. 3 Box 228  
Clinton, IL 61727-9351

10 CFR 50.73

U-603623  
June 09, 2003

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 2003-002-00

Enclosed is Licensee Event Report (LER) No. 2003-02-00: Manual Reactor Scram Due to Main Turbine Vibrations Caused by Deficient Procedure Guidance. This report is being submitted in accordance with the requirements of 10CFR50.73.

The enclosed report contains the following commitments:

- The vendor manual for the Main Turbine will be revised to include more restrictive temperature ramp rates for removing the main turbine and moisture separator reheaters from service.
- The modification process will be revised to incorporate an independent review of operating experience during the design phase.
- Plant procedures will be revised to incorporate the sensitivity of the monoblock turbine rotor with changing plant conditions.

Respectfully,



R. S. Bement  
Site Vice President  
Clinton Power Station

JLP/blf

Enclosures

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

*IEZ*

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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)

<b>1. FACILITY NAME</b> Clinton Power Station	<b>2. DOCKET NUMBER</b> 05000461	<b>3. PAGE</b> 1 OF 4
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**4. TITLE**

Manual Reactor Scram Due to Main Turbine Vibrations Caused by Deficient Procedure Guidance

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
04	11	2003	2003	002	00	06	09	2003	None	05000
									FACILITY NAME	DOCKET NUMBER
									None	05000

<b>9. OPERATING MODE</b> 1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>									
	20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)						
<b>10. POWER LEVEL</b> 033	20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)						
	20.2203(a)(1)	50.36(c)(1)(i)(A)	x 50.73(a)(2)(iv)(A)	73.71(a)(4)						
	20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)						
	20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER						
	20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	Specify in Abstract below or in						
	20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	NRC Form 366A						
	20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)							
	20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)							
	20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)							

**12. LICENSEE CONTACT FOR THIS LER**

<b>NAME</b> R. B. Mundlapudi, Turbine-Generator System Manager	<b>TELEPHONE NUMBER (Include Area Code)</b> (217) 937-3969
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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

**14. SUPPLEMENTAL REPORT EXPECTED**

<b>YES (If yes, complete EXPECTED SUBMISSION DATE)</b>	<b>NO</b>	<b>15. EXPECTED SUBMISSION DATE</b>	<b>MONTH</b>	<b>DAY</b>	<b>YEAR</b>
	x				

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

On April 11, 2003, with the plant in Mode 1 (Power Operation) while lowering reactor power in preparation for maintenance outage C1M13, the reactor was manually scrammed from 33 percent power in response to vibration levels on the Main Turbine approaching the automatic trip setpoint. The Low Pressure Turbine vibrations were caused by development of a minor rub between the rotating and stationary components as a result of the temperature change induced on the Low Pressure Turbine when the Moisture Separator Reheaters (MSRs) were removed from service. The root cause of the event was that operating procedures were deficient in providing sufficient operating restrictions of the new monoblock turbine rotor due to inadequate vendor guidance. Corrective actions to prevent recurrence include revisions to plant procedures and the turbine vendor manual to incorporate more restrictive heat up and cool down ramp rates. Additional corrective actions identified include providing expectations in the design modification process to require independent operating experience reviews during the design phase.

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

**A. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT:**

Unit: 1      Event Date: 04/11/2003      Event Time: 0146 Central Daylight Time (CDT)  
Mode: 1 (Power Operation)      Reactor Power: 033 percent  
Reactor Coolant System Temperature: 522 degrees Fahrenheit  
Reactor Coolant System Pressure: 952.2 pounds per square inch absolute

**B. DESCRIPTION OF THE EVENT:**

On April 11, 2003 during a plant shut down for maintenance outage C1M13, the reactor was manually scrammed in response to vibrations on the Main Turbine [TRB] approaching the automatic trip setpoint. The Operations crew had reduced power from 91 percent to 33 percent by inserting control rods and by closing the Reactor Recirculation (RR) Flow Control Valves [FCV] to establish conditions to shift the RR pumps from 100 percent speed to 25 percent speed. Also, the Moisture Separator Reheaters (MSRs) [MSR] were being removed from service. Turbine vibrations began to increase on several bearings and at 0132 hours, a high vibration alarm [VA] was received on the No. 6 turbine bearing. Increasing vibration levels were observed on turbine bearings No. 4, No. 6, and No. 8. The No. 4 and No. 6 bearing vibrations were rapidly approaching the automatic trip setpoint of 10 mils. As the vibration levels trended upward, Operators checked turbine lube oil temperatures, turbine lube oil pressure, and MSR preheating temperatures to the Low Pressure Turbine and found them to be within their normal ranges for the plant conditions.

The Low Pressure Turbine vibration was caused by development of a minor rub between the Low Pressure Turbine rotating and stationary components. This was the result of the temperature change induced on the Low Pressure Turbine by removal of the MSRs from service. At 0146 hours, with reactor power at approximately 33 percent, Operators manually scrammed the reactor by placing the Reactor Mode Switch in Shutdown. The main turbine tripped automatically after the scram due to high vibrations. All control rods inserted as designed. The maximum vibration reading for the No. 4 bearing was 10.3 mils, and the No. 6 bearing reached a maximum value of 10.4 mils. At the time of the turbine trip, the main generator output was 328 megawatts electric (gross). Clinton Power Station (CPS) Emergency Operating Procedure EOP-1, "RPV Control," and CPS procedure 4100.01, "Reactor Scram," were entered at 0146 hours and exited at 0323 hours when the plant was stable.

This event involved a valid actuation of the Reactor Protection System when the reactor was critical. The four-hour ENS notification required by 10CFR50.72(b)(2)(iv)(B) was completed at 0523 CDT (Event #39749). This LER is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv)(A).

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

## C. CAUSE OF THE EVENT

The entire turbine assembly was replaced as part of the Extended Power Uprate project in the last refueling outage (C1R08) to support up to a 20 percent increase over the previously licensed power level. The turbine rotor is a monoblock design and is more sensitive to changes in steam inlet temperature than the previous turbine rotor. Monoblock designs require the MSRs to be removed from service more slowly than with the previously installed turbine. If the ramp rate for removing the MSRs from service is too rapid, the probability of a turbine rub and high vibrations are greatly increased.

The root cause of the event is that the CPS operating procedure was deficient in providing sufficient guidance for operation of the new monoblock turbine rotor due to inadequate vendor guidance (and vendor manual).

Contributing to the event was inadequate vendor oversight by CPS personnel which resulted in the procedures and vendor manual not reflecting the sensitivity and behavior of the new monoblock rotor to MSR removal. Also contributing to the event was less than adequate knowledge of operating experience from other plants that have installed monoblock turbine rotors.

## D. SAFETY ANALYSIS

There were no actual safety consequences associated with this event. The potential safety consequences of the event were also minimal. The high vibration condition resulted in a manual scram followed shortly by an automatic turbine trip. Reactor critical parameters were monitored and controlled by Operations. No safety system failures resulted from this event. Turbine vibrations did not significantly exceed the high vibration trip setpoint and no damage to the turbine was incurred.

## E. CORRECTIVE ACTIONS:

CPS procedure 3106.01, "Moisture Separator Reheater," provides guidance to operators on how to remove and place the MSRs into service. This procedure has been revised to place more restrictive temperature controls on steam inlet temperatures for the main turbine when removing the MSRs from service. The revised ramp rates for the MSR and main turbine will be incorporated in the turbine vendor manual [ATI 153458-21]. A corrective action was completed to provide expectations requiring an independent review of operating experience as an input to the design process. The modification process will be revised to incorporate an independent operating experience review during the design phase [ATI 153458-22]. Plant procedures will be revised to incorporate the sensitivity of the monoblock rotor with changing plant conditions [ATI 153458-23].

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

## F. PREVIOUS OCCURRENCES:

There have been no previous occurrences of valid main turbine high vibrations causing a manual or automatic scram.

## G. COMPONENT FAILURE DATA:

There were no equipment failures associated with this event.