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10CFR50.73

April 25, 2003

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

Limerick Generating Station, Unit 2  
Facility Operating License Nos. NPF-85  
NRC Docket Nos. 50-353

Subject: LER 2-03-001, Unit 2 Scram due to Main Turbine Manual Trip

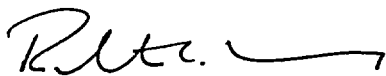
This Licensee Event Report (LER) addresses a Limerick Unit 2 unplanned automatic scram due to a manual trip of the main turbine as a result of a high vibration condition that developed during a planned plant shutdown.

Report Number: 2-03-001  
Revision: 00  
Event Date: March 3, 2003  
Discovered Date: March 3, 2003  
Report Date: April 25, 2003

This LER is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv)(A).

If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,



Robert C. Braun  
Vice President - Limerick

cc: H. J. Miller, Administrator Region I, USNRC  
A. L. Burritt, USNRC Senior Resident Inspector, LGS

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## LICENSEE EVENT REPORT (LER)

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digits/characters for each block)

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.

FACILITY NAME (1)

Limerick Generating Station, Unit 2

DOCKET NUMBER (2)

05000 353

PAGE (3)

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TITLE (4)

Main Turbine High Vibration Manual Turbine Trip and Automatic Scram During Planned Shutdown

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
03	03	2003	2003	001	00	04	25	2003	FACILITY NAME	DOCKET NUMBER	
										05000	
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OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check all that apply) (11)								
POWER LEVEL (10)		26	20 2201(b)			20 2203(a)(3)(ii)			50.73(a)(2)(ii)(B)		50 73(a)(2)(ix)(A)
			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)(iii)(A)				50 73(a)(2)(vii)(B)				

## LICENSEE CONTACT FOR THIS LER (12)

NAME

M. C. Kaminski, Manager – Regulatory Assurance

TELEPHONE NUMBER (Include Area Code)

(610) 718-3400

## COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	TA	TRB	1341	Y					

## SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).

X NO

EXPECTED  
SUBMISSION  
DATE (15)

MONTH

DAY

YEAR

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

An unplanned automatic scram occurred as a result of a manual main turbine trip. The main turbine developed a high vibration condition during a planned power reduction to enter a refueling outage. The main turbine developed a light radial rub due to an inadequate specification for clearance between the oil deflectors and the main shaft as a result of main turbine retrofit. The oil deflector clearance specification has been restored to the pre-retrofit value. In addition, the affected gland seal clearances were restored to design values. Also, the operating procedures were revised to ensure main condenser backpressure remains greater than 1.5 inches Hg when less than 50% power.

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

## Unit Conditions Prior to the Event

Unit 2 was in Operational Condition (OPCON) 1 (Power Operation) at approximately 25.5% power. There were no structures, systems or components out of service that contributed to this event. However, the main turbine and reactor feed pump high vibration turbine protection (EIS:IT) feature was out of service prior to and during the event.

## Description of the Event

On March 3, 2003, a planned Limerick Unit 2 shutdown was in progress to support entering a refueling outage. The power reduction had commenced at 09:00 hours starting at an initial power of 95.5%. At approximately 11:00 hours, power was at 29% and vibration on several main turbine (EIS:TRB) bearings (3,4,5 and 6) started to increase. The highest vibration occurred on bearing #3; which was previously operating at approximately 2 mils. At 11:20 hours, vibration on main turbine bearing #3 exceeded 10 mils. Operation in excess of 10 mils is permitted for 15 minutes per the alarm (EIS:VA) response procedure but a manual main turbine trip is required when 12 mils is exceeded.

At 11:25 hours, a manual trip of the main turbine was performed at 25.5% power when the vibration on bearing #3 exceeded 12 mils. An automatic actuation of the reactor protection system (RPS) was initiated by the "turbine stop valves closed" signal as designed. This RPS trip function was still active because power (25.5%), as measured by main turbine first stage pressure, had not been reduced below the reset value for the "bypass" trip units. All control rods inserted as designed. The maximum main turbine vibration level was 17 mils and occurred during coastdown through critical speed.

Reactor pressure peaked at approximately 997 psig and was controlled by the main turbine bypass valves (BPV). The lowest main steam relief valve (MSRV) setpoint of 1170 psig was not exceeded; therefore, no actuation of MSRVs occurred.

Reactor narrow range level dropped to approximately +6 inches resulting in Group 2A and 2B RHR isolations that occurred as designed at +12.5 inches. The Group 2A and 2B RHR isolation valves were in the closed position prior to the event. Reactor level subsequently increased to approximately +48 inches and did not exceed the high-level trip setpoint of the reactor feed pumps (RFP) and High Pressure Coolant Injection (HPCI) system, which is +54 inches.

In addition, the end-of-cycle recirculation pump trip (EOC-RPT) system actuated as designed due to the main turbine stop valve closure with reactor power greater than the "bypass" setpoint.

The main turbine and reactor feed pump high vibration trip function was in the bypassed condition during the planned shutdown due to a previously degraded power supply in the turbine supervisory instrumentation (TSI) system. The shutdown briefing included a discussion of the operator actions that would be required to address a main turbine high vibration condition during shutdown, including tripping the main turbine at 12 mils.

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

This event involved a valid automatic actuation of the RPS system when the reactor was critical. The 4-hour ENS notification required by 10CFR50.72(b)(2)(iv)(B) and the 8-hour ENS notification required by 10CFR50.72(b)(3)(iv)(A) was completed on March 3, 2003 at 14:44 EST hours (Event# 39632).

This event involved an automatic actuation of the reactor protection system. Therefore, this LER is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv)(A).

**Analysis of the Event**

There were no actual safety consequences associated with this event. The potential safety consequences of this event were also minimal. The high vibration condition resulted in a manual main turbine trip and automatic reactor scram. Reactor critical parameters were monitored and controlled by Operations.

The Unit 2 main turbine retrofit was completed in 1999 (2R05). The Unit 1 main turbine retrofit was completed in 1998 (1R07). During retrofit, a Siemens turbine replaced the General Electric (GE) original equipment. The oil deflectors are the original GE equipment. The oil deflector gap specification on the new Siemens turbine was identified to be smaller than the original GE turbine. The Siemens turbine specification was .024 inches of clearance between the oil deflector and the main shaft; the GE turbine specification was nominal .040 inches. The close tolerance on the oil deflector gap was identified as a potential source of rubs in 2000. A modification was initiated (ECR 00-00582) to restore the gaps to the original nominal .040 inch GE specification.

During the recent Unit 2 refueling outage (2R07), a main turbine inspection was performed to examine the oil deflector and gland seal clearances. The as-found clearance on several oil deflectors was less than .040 inches. The oil deflector clearances were increased to meet the revised specification of nominal .040 inches. Also, several gland seal clearances were identified as less than the design value. The affected gland seal clearances were restored to design values with the exception of #4 and #5, which will be restored in the next Unit 2 refueling outage. The existing clearances on #4 and #5 are adequate for one cycle of operation based on the changes in operating procedures that limits backpressure.

The investigation of the high vibration issue also identified a correlation between low condenser (EII:SG) pressure and the initiation of main turbine rubs. Main condenser backpressures of less than 1.0 inches Hg during shutdown or startup cause displacement of the turbine hood and shaft. There is industry experience on this issue that identifies low backpressure as a contributing factor to initiation of turbine rubs.

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

### Cause of the Event

The cause of the event was a light radial rub that developed at #3 bearing outboard oil seal due to the tight oil deflector gaps on the main turbine at .024 inches. In addition, the low-pressure turbine gland seal clearances were inadequate due to gland case misalignment. Also, operation at main condenser backpressures of less than 1.0 inches Hg contributes to initiation of rubs at the oil deflectors during main turbine startup and shutdown.

### Corrective Action Completed

The affected Unit 2 main turbine oil deflector gaps were resized to nominal .040 inches.

The affected Unit 2 low-pressure turbine gland seal clearances, #3 and #7, were restored to design values.

Operating procedures were revised to maintain main condenser backpressure above 1.5 inches Hg when less than 50% power.

### Corrective Action Planned

The affected Unit 1 main turbine oil deflector gaps will be resized to nominal .040 inches during the next refueling outage opportunity.

The affected Unit 1 low-pressure turbine gland seal clearances will be restored to design values as required during the next refueling outage opportunity.

The Unit 2 low-pressure turbine gland seals #4 and #5 clearances will be restored to design values during the next refueling outage opportunity.

### Previous Similar Occurrences

There were no previous occurrences of main turbine high vibration that resulted in a main turbine trip and subsequent automatic scram.

### Component data:

System: TA (Main Turbine System)  
Component: TRB (Turbine)  
Manufacturer: 1341 (Siemens)  
Model number: 27-0119 LP