

FOL 2.E

June 28, 2005

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

Limerick Generating Station, Unit 2
Facility Operating License No. NPF-85
NRC Docket No. 50-353

Subject: LER 2-05-003, Transient Exceeded Licensed Maximum Power Level

This Licensee Event Report (LER) addresses a period of operation between 100% and 107% of rated thermal power due to a speed control failure on the 2A reactor recirculation pump motor-generator. This event resulted in a license violation regarding the maximum power level limit of 3458 megawatts thermal.

Report Number: 2-05-003
Revision: 00
Event Date: May 31, 2005
Discovered Date: May 31, 2005
Report Date: June 28, 2005

This LER is being submitted pursuant to the requirements of License Condition 2.E, which requires a 30-day written followup in accordance with the procedures described in 10CFR50.73(b), (c), and (e).

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

Sincerely,

Original signed by

Ron J. DeGregorio
Vice President - Limerick
Exelon Generation Company, LLC

cc: S. J. Collins, Administrator Region I, USNRC
S. L. Hansell, USNRC Senior Resident Inspector, LGS

SUMMARY OF EXELON NUCLEAR COMMITMENTS
LS-AA-117-1003 Rev. 2

The following table identifies commitments made in this document. Any other actions discussed in the submittal represent intended or planned actions. These actions are described to the NRC for the NRC's information and are not intended as regulatory commitments.

Commitment #1	Committed Date (or Outage):	None
	None	

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)

FACILITY NAME (1) Limerick Generating Station, Unit 2	DOCKET NUMBER (2) 05000 353	PAGE (3) 1 OF 4
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TITLE (4)
Operation Exceeding License Maximum Power Level

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
05	31	2005	2005	003	00	06	28	2005	FACILITY NAME	DOCKET NUMBER
										05000
										05000
OPERATING MODE (9)	1		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)							
POWER LEVEL (10)	100		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)			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 Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)	
			20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)	
			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)	

LICENSEE CONTACT FOR THIS LER (12)

NAME Robert E. Kreider, Manager – Regulatory Assurance	TELEPHONE NUMBER (Include Area Code) (610) 718-3400
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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	AD	SC	B045	N					

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

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

An unplanned reactor power increase to approximately 107% of rated thermal power occurred due to a failure of the speed control for the 2A reactor recirculation pump motor-generator. A printed circuit card soldered connector failure resulted in the fluid coupler scoop tube moving to the maximum speed mechanical stop. Operators immediately reduced power to less than 100% by reducing the speed on the 2B reactor recirculation pump. The failed circuit card was replaced and the pump speed control was returned to service.

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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 100% power. There were no structures, systems or components out of service that contributed to this event.

Description of the Event

On Tuesday May 31, 2005, at 10:29 hours, while Unit 2 was operating at approximately 100% power, the licensed operators observed the following alarms (EIS:ALM): 2A Recirc M-G Fluid Drive Scoop Tube Lock, Reactor High Pressure, and Bypass Valves Open. The operators subsequently observed that reactor power had increased to 106 percent as indicated on the Average Power Range Monitors (APRMs) and three main steam bypass valves had opened.

The operators entered procedures OT-102 Reactor High Pressure and OT-104 Unexpected/Unexplained Positive Or Negative Reactivity Insertion. The reactor operator observed that the 2A reactor recirculation (EIS:AD) motor-generator speed had increased to the high-speed stop. The reactor operator attempted to reduce the speed of the 2A reactor recirculation motor-generator but it would not respond due to the locked scoop tube condition. The reactor operator then reduced power to less than 100 percent, limiting the overpower condition to approximately 90 seconds, by reducing the speed of the 2B Reactor Recirculation Pump. During the event reactor pressure increased to approximately 1054 psig which resulted in a reactor high pressure alarm and three main steam bypass valves briefly opening. Pressure did not exceed the reactor scram setpoint of 1096 psig. The maximum thermal power peak was later determined to be 107 percent.

The 2A reactor recirculation motor-generator scoop tube brake automatically actuated as designed when the scoop tube high-speed electrical stop limit switch operated. This feature prevents further speed adjustments using the main control room speed controller until the scoop tube brake is manually reset.

An investigation determined that the condition was caused by a loss of continuity on a soldered terminal on a printed circuit card located in the motor-generator fluid coupler scoop tube positioner (EIS:SC). Power was restored to 100% on Wednesday June 1, 2005 at 18:09 hours.

The 2A reactor recirculation motor-generator speed control was restored to normal operation on Friday June 3, 2005 at 13:27 hours.

During the transient on Tuesday May 31, 2005, at 10:31 hours, Technical Specification 3.4.1.3 Recirculation Pumps action "a" was entered since recirculation loop flows were not within 5 percent of each other with core flow greater than 70 percent of rated core flow; the actual flow mismatch was 47 percent. This action required restoring the recirculation loop flows to within the specified limit within 2 hours or taking action "b". Action "b" requires shutting down one recirculation loop within the next 8 hours. Recirculation loop flows were restored to within the specification at 14:26 hours by manually reducing the speed of the 2A reactor recirculation motor-generator at the scoop tube positioner and increasing the speed of the 2B reactor recirculation motor-generator.

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

This event involved a condition that was prohibited by the plant's Facility Operating License (FOL) Section 2.C.(1) Maximum Power Level. The FOL Section 2.E. requires that violations of FOL Section 2.C be reported by ENS within 24 hours with written followup within 30 days in accordance with the procedures described in 10CFR50.73(b), (c), and (e). The ENS notification (EN# 41736) was completed on May 31, 2005 at 17:22 EDT hours. This LER is being submitted pursuant to the requirements of the Facility Operating License Section 2.E.

Analysis of the Event

There were no actual safety consequences associated with this event. The potential safety consequences of this event were also minimal. Operators took prompt action to decrease reactor power which terminated the overpower condition in approximately 90 seconds. The event was bounded by the plant accident analysis.

The actual event was similar to the slow flow increase event described in GESTAR II and was bounded by the results of the GESTAR II analysis. The fuel safety limits were not challenged. Engineering analysis of the event determined that the highest thermal limit was Maximum Fraction of Limiting Critical Power Ratio (MFLCPR) with a value of 0.947.

The plant licensing basis for a slow recirculation flow increase event is described in GESTAR II. The event analyzed is a single recirculation loop speed control failure. A dual loop failure is not credible since a modification removed the master flow controller. The slow flow increase event does not result in a reactor scram. The flow dependent Minimum Critical Power Ratio (MCPR) and Maximum Average Planar Linear Heat Generation Ratio (MAPLHGR) limits were developed from this analysis and are documented in the Core Operating Limits report (COLR).

The Limerick UFSAR describes a "Recirculation Flow Control Failure With Increasing Flow" transient in the Chapter 15 Accident Analysis, section 15.4.5. The UFSAR analysis assumes worst-case initial conditions of 57 percent nuclear boiler rated (NBR) power and 39.6 percent core flow. An APRM neutron flux upscale scram terminates the power transient. No fuel damage occurs as a result of the transient.

Vendor failure analysis of the failed amplifier (EIS:AMP) card identified an intermittent plated-through-hole (PTH) connector on the circuit card. This connector failure adversely affected the speed control by stopping the Silicon Controlled Rectifiers (SCRs) firing pulses in the decreasing speed direction while the SCR firing pulses in the increasing direction were not affected. This resulted in driving the scoop tube position to maximum. The connector failure was likely caused by card age, manufacturing deficiency, refurbishment practices, and/or mishandling during installation or storage. The failure of PTH connections cannot be detected via visual exam. This type of failure can only be detected via circuit card testing.

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

The scoop tube positioner operates using a servo-amplifier circuit to nullify input error. This circuit is comprised of a set of balanced transistors that provide the firing pulses to opposing SCRs that regulate the positioner drive motor armature current. At steady state, the SCR pulses counteract each other to maintain the scoop tube position at the operator defined setpoint. The inputs to the servo-amplifier circuit are the reactor recirculation pump (RRP) speed controller output and feedback from an internal positioner Linear Variable Displacement Transducer (LVDT). When an imbalance is introduced (i.e., error signal via a demanded speed change) the amplifier responds by increasing the number of firing pulses in the appropriate direction to resolve the error.

Cause of the Event

The cause of the event was a failure of the 2A reactor recirculation pump motor-generator fluid coupler scoop tube positioner speed control amplifier. A PTH connector failed on a printed circuit card that was located in the scoop tube positioner.

Corrective Action Completed

The printed circuit card was replaced and the speed control was restored to normal operation.

Corrective Action Planned

An evaluation of the vendor refurbishment practices for Bailey servo-amplifier cards will be performed. This action will be complete by September 30, 2005.

Previous Similar Occurrences

There were no previous occurrences of a failure of the reactor recirculation pump motor-generator speed control that caused power to exceed the licensed maximum power level.

Component Data

Component: XC-M1-2R622A Recirculation Flow Control A Controller
 Cause: B (Design, Manufacturing, Construction/Installation)
 System: AD (Reactor Recirculation System)
 Component: SC (Control, Speed)
 Manufacturer: B045 (ABB Automation Inc.)
 Model number: 721002AAAA1
 Part Number: 6619848A1
 Serial number: 171869
 Stock code number: 115-00478