

Exelon Generation Company, LLC www.exeloncorp.com
Byron Station
4450 North German Church Road
Byron, IL 61010-9794

March 31, 2004

LTR: BYRON 2004-0033
File: 2.01.0700

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Supplement One to Licensee Event Report (LER) 454-2003-003-00,
 "Licensed Maximum Power Level Exceeded Due to Inaccuracies in
 Feedwater Ultrasonic Flow Measurements Caused by Signal Noise
 Contamination"

Byron Station, Unit 1 and Unit 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Enclosed is a supplemental report to an LER involving an overpower condition on Byron Station Unit 1 and Unit 2 as a result of inaccuracies discovered in the measurement of feedwater flow using an ultrasonic flow measurement system. The supplemental information involves the results of a tracer test performed to further determine the accuracy of feedwater flow.

Should you have any questions concerning this matter, please contact Mr. William Grundmann, Regulatory Assurance Manager, at (815) 234-5441, extension 2800.

Respectfully,



Stephen E. Kuczynski
Site Vice President
Byron Nuclear Generating Station

Attachment LER 454-2003-003-01

cc: Regional Administrator, Region III, NRC
 NRC Senior Resident Inspector- Byron Station

IE22

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)

1 FACILITY NAME Byron Station, Unit 1	2 DOCKET NUMBER 05000454	3 PAGE 1 OF 5
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4. TITLE
Licensed Maximum Power Level Exceeded Due to Inaccuracies in Feedwater Ultrasonic Flow Measurements

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
08	28	2003	2003	003	01	03	31	2004	Byron, Unit 2	0500455
									FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 6: (Check all that apply)									
	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
10. POWER LEVEL 100	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 73.71(a)(4)						
<input type="checkbox"/>	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input checked="" type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)							
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)							
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)							
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)							
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)							
<input type="checkbox"/>	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)							

12. LICENSEE CONTACT FOR THIS LER	
NAME William Grundmann, Regulatory Assurance Manager	TELEPHONE NUMBER (Include Area Code) (815) 406-2800

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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

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

Byron Station Unit 1 and Unit 2 exceeded their licensed maximum power level by 2.62% and 1.88%, respectively. In May of 2000 an Ultrasonic Flow Measurement System (UFMS) was installed on the main feedwater lines to the steam generators to more accurately measure feedwater flow. This corrected feedwater flow is then used in the reactor power calorimetric calculation. Feedwater flow pressure pulses occurred at frequencies that affected the UFMS signal and resulted in a bias in the determinations of the flow correction factors. This resulted in a non-conservative calorimetric calculation. When reactor power was adjusted to match the calorimetric power, an overpower condition was created. When this condition was discovered the UFMS was removed from service. Implementation of the UFMS has been suspended. Analyses performed indicated there was no adverse safety impact for the overpower condition on each unit. In accordance with Byron Station Unit 1 License Condition 2.F and Byron Station Unit 2 License condition 2.G, a notification was made to the NRC at 1355 CST on August 28, 2003, due to the violation of license condition 2.C(1) of each license, "Maximum Power Level."

NRC FORM 366A (7-2001)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 07/31/2004		
LICENSEE EVENT REPORT (LER) TEXT CONTINUATION				Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Information and Records Management Branch (t-6 f33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office Of Management And Budget, Washington, DC 20503. If 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.		
FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)		PAGE (3)
Byron Station, Unit 1		STN 05000454		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
				2003 - 003 - 01		2 of 5

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

A. Plant Conditions Prior to Event:

Event Date/Time: August 28, 2003 / 1743 hours

Unit 1 - Mode 1 – Power Operations, Reactor Power 100%

Unit 2 - Mode 1 – Power Operations, Reactor Power 100%

Reactor Coolant System [AB] for both units: Normal operating temperature and pressure.

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

Background

An Ultrasonic Flow Measurement System (UFMS) was installed on each of the four main feedwater [SJ] loops and was utilized as a calibration tool to correct feedwater venturi flow measurements through use of a correction factor. The UFMS uses ultrasonic cross-correlation technology to measure feedwater flow. The UFMS vendor for Byron Station is Advanced Measurement and Analysis Group (AMAG), Inc.

B. Description of Event:

Byron Station Units 1 and 2 installed the UFMS in May 1999. During testing, measurements of the correction factors indicated an unexpected difference between the Braidwood Station Unit 1 and Byron Station Unit 1 feedwater venturi flowrates and venturi correction factors. This resulted in different megawatt electric recoveries between the two Units with Byron Station Unit 1 potentially generating more megawatts electric (approximately 15 mw) than Braidwood Station Unit 1.

An evaluation was conducted to determine and understand the difference between Byron Station Unit 1 and Braidwood Station Unit 1 and was inconclusive. However, the evaluation did verify the UFMS was installed correctly and it was operating within design criteria established for the UFMS. Consequently, a decision was made to implement feedwater venturi correction factors using the UFMS at Byron in May 2000.

Over the next several months, additional internal and external evaluations were conducted in an attempt to understand the discrepancy between the two units. The results of these investigations concluded that the UFMS was operating in accordance with the criteria required by the UFMS vendor.

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A broader test plan was developed in early 2003 to continue the investigation. In May 2003, a flow comparison test with the common main feedwater header UFMS flow to the sum of the UFMS measurement in the four main feedwater loops was conducted on Braidwood Station Unit 1. The results of this test were within the acceptance criteria. In August 2003, this test was re-performed at Byron Station Unit 1. The difference between the sum of the UFMS measurements in the four main feedwater loops and the common main feedwater header was outside the acceptance criteria (1.572% compared to a maximum allowable statistical limit of 0.70%). With this test outside of its acceptance criteria, Byron Station reduced power and returned the correction factors to 1.0 on both units, pending resolution of the issue.

Upon investigation by site and vendor personnel, it was determined that signal noise affected the flow velocity calculations, which in turn affected the determination of the correction factors. With the noise contaminated correction factors used in the calorimetric calculation, a non-conservative or lower power measurement resulted. When reactor power was adjusted to match the calorimetric power, an overpower condition was created. An overpower condition on Unit 1 and Unit 2 potentially existed since initial implementation in May 2000.

As part of the UFMS independent review, a flow measurement utilizing a radioactive tracer was performed on the Unit 1 and Unit 2 main feedwater systems. The tracer results indicated there was a non-conservative bias in the UFMS installed on the common main feedwater header. This test also validated the accuracy of the installed venturi flow measurement system.

The originally reported worst-case overpower conditions on Unit 1 and Unit 2 (Sept. 2003) were based on the premise that the UFMS on the common main feedwater header was providing accurate flow measurements. Based on the results of the tracer test on Unit 1 and Unit 2 validating the accuracy of the venturi flow measurement, the worst-case overpower is now based on the maximum UFMS correction factor applied to the venturi flow measurement. The worst-case overpower conditions are 102.62% for Unit 1 and 101.88% for Unit 2.

In accordance with Byron Station Unit 1 License Condition 2.F and Byron Station Unit 2 License condition 2.G notification was made to the NRC at 1355 CST on August 28, 2003, due to the violation of License Condition 2.C(1) of each license, "Maximum Power Level."

C. Cause of Event:

The initial root cause of this event was determined to be noise contamination of the UFMS ultrasonic signal. Feedwater flow pressure pulses occurred at frequencies that affected the UFMS signal and resulted in a bias in the determinations of the flow correction factors. This noise caused the UFMS to indicate a lower than actual feedwater flowrate which resulted in a non-conservative calorimetric calculation.

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Contributing causes were a lack of questioning attitude during the implementation and subsequent evaluations and the failure to use the diagnostic tool which could have identified the noise.

Based on the result of the tracer test mentioned above, the initial root cause for inaccuracies in the feedwater ultrasonic measurement is incomplete. The UFMS vendor is currently investigating the performance issues associated with the UFMS.

D. Safety Consequences:

The evaluations below envelope the revised overpower condition discussed in section B.

The safety significance of the overpower issue for Byron Station Units 1 and 2 has been evaluated by Westinghouse and Exelon Nuclear Fuels. The evaluations considered a conservatively bounding overpower value of 102.62% plus a 2% of the Byron uprated power limit (i.e., 3586.6 Mwt) calorimetric uncertainty. Byron station implemented a 5% power uprate in May 2001. The impact of the overpower condition was evaluated for pre and post power uprate operations. The following areas were reviewed:

Design Transients

Operating Margin to Reactor Trip

Neutron Fluence Projections, Reactor Vessel Integrity, and Low Temperature Overpressure Protection

Loss of Coolant Containment Integrity

Steamline Break Containment Integrity

All Updated Final Safety Analysis Report Chapter 15 accidents

Fuel Evaluation

The acceptance criteria were met for all the evaluated events.

This event did not result in a safety system function failure.

E. Corrective Actions:

Byron Station Units 1 and 2 reduced reactor power to ensure the licensed thermal power limit was not being exceeded. Additionally, the correction factors for the feedwater flow venturis were reset to 1.0.

The implementation of the UFMS has been suspended.

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F. Previous Occurrences:

There were no previous occurrences of a violation of licensed maximum power level due to the UFMS system noise. Byron reported an overpower of 0.12% on Unit 1 and 2 due to personnel error while using the UFMS system (LER 2001-001-01 dated June 14, 2001.)

G. Component Failure Data:

N/A