

Exelon Generation Company, LLC      www.exeloncorp.com  
Braidwood Station  
35100 South Rt 53, Suite 84  
Braceville, IL 60407-9619  
Tel. 815-417-2000

March 30, 2004  
BW040035

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

Braidwood Station, Unit 1  
Facility Operating License No. NPF-72  
NRC Docket No. STN 50-456

Braidwood Station, Unit 2  
Facility Operating License No. NPF-77  
NRC Docket No. STN 50-457

Subject: Submittal of Licensee Event Report Number 2004-001-00, "Licensed Maximum Power Level Exceeded Due to Inaccuracies in Feedwater Ultrasonic Flow Measurements"

Reference: LER 2003-002, "Licensed Maximum Power Level Exceeded Due to Inaccuracies in Feedwater Ultrasonic Flow Measurements Caused by Signal Noise Contamination," dated September 30, 2003

The enclosed Licensee Event Report (LER) is being submitted in accordance with Braidwood Station Unit 1 and Unit 2 License Condition 2.G due to violating license condition 2.C(1), "Maximum Power Level." License Condition 2.G requires an LER to be submitted within 30 days after discovery of the event. Therefore, this report is being submitted by March 31, 2004.

Braidwood Station previously reported an overpower condition on Unit 2 under LER 2003-002 (Reference) on September 30, 2003. We are withdrawing LER 2003-002 as the attached LER discusses overpower conditions on both Unit 1 and Unit 2.

Should you have any questions concerning this submittal, please contact Kelly Root, Regulatory Assurance Manager, at (815) 417-2800.

Respectfully,



Thomas P. Joyce  
Site Vice President  
Braidwood Station

Enclosure: LER Number 2004-001-00  
cc: Regional Administrator - Region III  
NRC Braidwood Senior Resident Inspector

JE22

NRC FORM 366 (7-2001)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004 Estimated burden per response to comply with this information collection request: 50.0 hrs. 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, NOEB-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.
<b>LICENSEE EVENT REPORT (LER)</b>		

<b>1. FACILITY NAME</b> Braidwood, Unit 1	<b>2. DOCKET NUMBER</b> STN 05000456	<b>3. PAGE</b> 1 of 4
--	---	--------------------------

**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	YEA	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	01	2004	2004-001-00			03	31	2004	Braidwood, Unit 2	STN 05000457
									FACILITY NAME	DOCKET NUMBER
									N/A	N/A

<b>9. OPERATING MODE</b>	1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>							
<b>10. POWER LEVEL</b>	100	<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"/> 73.73(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"/> 73.73(a)(2)(ix)(A)				
		<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input 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 checked="" type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A			
<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)							
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

**12. LICENSEE CONTACT FOR THIS LER**

<b>NAME</b> Carl Dunn, Engineering Manager	<b>TELEPHONE NUMBER (Include Area Code)</b> (815) 417-3800
---	---

**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
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

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

Braidwood Station Unit 1 and Unit 2 exceeded their licensed maximum power level by up to 1.07% and 1.21%, respectively. In May 1999, 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 was 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 noise-contaminated portion of the UFMS was removed from service. After further testing and analysis, the UFMS was fully 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 Braidwood Station Unit 1 and Unit 2 License Condition 2.G, an ENS notification was made to the NRC at 1905 CST on March 1, 2004, due to the violation of License Condition 2.C(1) " Maximum Power Level," of each license.

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Braidwood, Unit 1	STN 05000456				2 of 4
		2004 - 001 - 00			

A. Plant Operating Conditions Before The Event:

Unit: 1/2                      Event Date: March 1, 2004                      Event Time: 1500

MODE: 1                      Reactor Power: 100 percent

Reactor Coolant System [AB]: 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 the common main feedwater header 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 Braidwood Station is Advanced Measurement and Analysis Group (AMAG), Inc.

B. Description of Event:

Braidwood Station Units 1 and 2 installed the UFMS in May 1999. Braidwood implemented the venturi correction factors using UFMS in June 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. Byron implemented the venturi correction factors using UFMS 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.

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 measurements 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 UFMS flow 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

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Braidwood, Unit 1	STN 05000456				3 of 4
		2004 - 001 - 00			

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 June 1999.

As part of the UFMS independent review, a flow measurement utilizing a radioactive tracer was performed on the Byron 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 condition on Unit 2 (September 2003) was 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 Byron Unit 1 and Unit 2 validating the accuracy of the venturi flow measurement at Byron, the worst-case overpower is now based on the maximum UFMS correction factor applied to the venturi flow measurement. Based on the results of the tracer testing on Byron Unit 1 and Unit 2, it was assumed that similar results would be obtained on both Braidwood Units. The worst-case overpower conditions are 101.07% for Unit 1 and 101.21% for Unit 2.

In accordance with Braidwood Station Unit 1 and Unit 2 License Condition 2.G, an ENS notification was made to the NRC at 1905 CST on March 1, 2004, due to the violation of License Condition 2.C(1) "Maximum Power Level," of each license.

**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.

Based on the results of the tracer test mentioned above, the initial root cause for inaccuracies in the feedwater ultrasonic flow measurements 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 Braidwood Station Unit 1 has been evaluated by Westinghouse and Exelon Nuclear Fuels. The evaluation considered a conservatively bounding overpower value of 101.09% of rated thermal

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Braidwood, Unit 1	STN 05000456	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 of 4
		2004	- 001	- 00	

power plus 2% of the calorimetric uncertainty for Braidwood Unit 1 operating cycles 9, 10, and 11. The evaluation considered a conservatively bounding overpower value of 102.62% of rated thermal power plus 2% of the calorimetric uncertainty for Braidwood Unit 2 operating cycles 8, 9, and 10. Braidwood Station Unit 1 and Unit 2 implemented a 5% power uprate in May 2001. The impact of the overpower condition was evaluated for both 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 Accident 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 functional failure.

**E. Corrective Actions:**

Braidwood Station Units 1 and 2 reduced reactor power to ensure that licensed thermal power limit was not being exceeded. Additionally, the correction factors for the feedwater flow venturis were reset to 1.0 (i.e., the null value). The reset of the correction factors was performed based on the conclusions of an independent vendor review of the UFMS issues.

The implementation of UFMS has been suspended.

**F. Previous Occurrences:**

Braidwood Station previously reported an overpower condition on Unit 2 under LER 2003-002 on September 30, 2003. This LER supercedes the information provided in LER 2003-002.

**G. Component Failure Data:**

<u>Manufacturer</u>	<u>Nomenclature</u>	<u>Model</u>	<u>Mfg. Part Number</u>
N/A	N/A	N/A	N/A