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September 30, 2003
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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

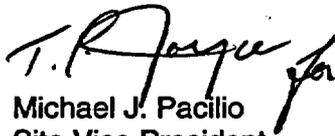
Braidwood Station, Unit 2
Facility Operating License No. NPF-77
NRC Docket No. STN 50-457

Subject: Submittal of Licensee Event Report Number 2003-002-00, "Licensed Maximum Power Level Exceeded Due to Inaccuracies in Feedwater Ultrasonic Flow Measurements Caused by Signal Noise Contamination"

The enclosed Licensee Event Report (LER) is being submitted in accordance with Braidwood Station 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 September 30, 2003.

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

Respectfully,



Michael J. Pacilio
Site Vice President
Braidwood Station

Enclosure: LER Number 2003-002-00

cc: Regional Administrator - Region III
NRC Braidwood Senior Resident Inspector

IE22

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 bj1@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.
LICENSEE EVENT REPORT (LER)		

1. FACILITY NAME Braidwood, Unit 2	2. DOCKET NUMBER STN 05000457	3. PAGE 1 of 4
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4. TITLE
 Licensed Maximum Power Level Exceeded Due to Inaccuracies in Feedwater Ultrasonic Flow Measurements Caused by Signal Noise Contamination

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
08	31	2003		2003-002-00		09	30	2003	N/A	N/A
									N/A	N/A

9. OPERATING MODE	1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)								
10. POWER LEVEL	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	
		<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)	Specify in Abstract below or in NRC Form 366A		
		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>				

12. LICENSEE CONTACT FOR THIS LER

NAME Carl Dunn, Engineering Manager	TELEPHONE NUMBER (Include Area Code) (815) 417-3800
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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 2 exceeded its licensed maximum power level by approximately 0.39%. In June of 1999 an Ultrasonic Flow Measurement System (UFMS) was installed on the feedwater lines to the steam generator in order to more accurately measure feedwater flow. This measured feedwater is then used in the reactor power calorimetric calculation. Feedwater flow pressure pulses occurred at frequencies which affected the UFMS signals and resulted in a bias in the determination of the flow correction factors. This resulted in a non-conservatively low 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. Corrective actions include installation of the UFMS in portions of the feedwater piping that are less susceptible to noise that could affect the UFMS signal, or installing noise filters on the four feedwater lines. In addition, the appropriate procedures will be revised to check for this noise when utilizing the UFMS to determine flow correction factors. An analysis performed indicated there was no adverse safety impact for the overpower condition and that Braidwood Unit 2 was always operated within the bounds of existing analyses. In accordance with Braidwood Station Unit 2 License Condition 2.G a notification was made to the NRC at 1443 CST on August 31, 2003, due to violation of license condition 2.C(1), " Maximum Power Level."

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A. Plant Operating Conditions Before The Event:

Unit: 2 Event Date: August 31, 2003 Event Time: 1443
 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) is installed on each of the four feedwater [SJ] loops and is utilized as a calibration tool to correct feedwater venturi flow measurements through use of a correction factor (CF). The UFMS uses ultrasonic technology coupled with cross-correlation statistical techniques to measure feedwater flow by determining the displacement of time it takes for flow turbulences to travel a known distance in the feedwater piping. The UFMS vendor for Braidwood Station is Advanced Measurement and Analysis Group, Inc.

B. Description of Event:

Braidwood Station implemented the UFMS in June 1999; Byron Station in May 2000. During testing, measurements of the CFs indicated an unexpected difference between the Braidwood Station Unit 1 and Byron Station Unit 1 venturi CFs. This resulted in Byron Unit 1 generating more megawatts electric (approximately 15 mw) than Braidwood Unit 1.

An evaluation was conducted to determine and understand the difference between Byron Station Unit 1 and Braidwood Station Unit 1. This evaluation was inconclusive. 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 determined 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 of the common feedwater header UFMS to the four feedwater loops was conducted on Braidwood Station Unit 1. The results of this test were within acceptable limits, as expected. 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 feedwater loops and the common header was outside of the acceptance criteria.

Upon investigation by Byron site and vendor personnel, it was determined that the signal noise affected the flow velocity calculations, which in turn affected the determination of the CFs. With the noise contaminated CFs entered into the calorimetric calculation, a non-conservative or lower power measurement resulted. When reactor power was adjusted to 100% calorimetric, an overpower condition was created.

Braidwood Units 1 and 2 were reviewed on August 30, 2003. The UFMS vendor recommended Braidwood Unit 1 continue to operate in its current condition since

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the common header test performed in May 2003 verified the composite flow being measured by the four feedwater loops was accurate and valid (within 0.021%). The UFMS vendor recommended that the correction factors in the Braidwood Unit 2A and 2B loops be returned to 1.0 (i.e., flow measurement returned to the venturis) since noise was noted in these loops and no common header reading was then available for comparison.

For Braidwood Unit 2, the CFs obtained from the UFMS installed on the four feedwater loops indicated a historical worst case feedwater flow correction of 1.21%. The UFMS installed on the common feedwater header, which is believed to be accurate due to the absence of noise, indicated a feedwater flow correction of 0.82%. Consequently, the difference between the two corrections, 0.39%, is considered to be the amount of overpower. Thus Braidwood Unit 2 maximum power was 100.39%.

In accordance with Braidwood Station Unit 2 License Condition 2.G a notification was made to the NRC at 1433 CST on August 31, 2003, due to violation of license condition 2.C(1), "Maximum Power Level."

C. Cause of Event

The root cause of this event was noise contamination of the UFMS ultrasonic signal. Feedwater flow pressure pulses occurred at frequencies which affected the UFMS signals and resulted in a bias in the determination 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 result.

Contributing causes are lack of questioning attitude during the implementation and subsequent evaluations and the failure to use the vendor's diagnostic tool which could identify the noise.

D. Safety Consequences:

To evaluate the effect of an overpower condition of 0.39% rated thermal power (RTP), the Daily Power Calorimetric Accuracy calculation was examined. The acceptance criteria for the calculation is that the overall calorimetric accuracy be less than 2.0% RTP, which is the value of uncertainty accounted for in all the plant design and transient analyses that use RTP. The Daily Power Calorimetric Accuracy calculation was then re-evaluated using the actual UFMS mass flow uncertainty. The result of this evaluation was an overall total uncertainty of +/- 1.58% RTP. This equates to a margin of 0.42% RTP with respect to the acceptance criteria of 2.0% RTP.

Applying a known bias of 0.39% RTP (for the Braidwood U2 overpower condition) by the most conservative means (algebraic addition) to the overall total uncertainty value of +/- 1.58% RTP would result in an uncertainty band of + 1.97% RTP and - 1.19% RTP. This still provides positive margin with respect to the acceptance criteria of 2.0% RTP.

Therefore, there was no impact on any analyzed accident or transient or other design analysis that uses RTP, because they are all analyzed in a manner that accommodates an overall uncertainty greater than the combined effect of the actual uncertainty and the known bias from the signal contamination that was

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present during the overpower condition. Operation of Braidwood U2 was always within the bounds of the existing analyses.

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

E. Corrective Actions:

Braidwood Station Unit 2 reduced reactor power to ensure that licensed thermal power limit was not being exceeded. Additionally, the CFs for the affected feedwater flow venturis (i.e., the 2A and 2B loops) were reset to 1.0.

The noise contaminated UFMS on loops 2A and 2B will remain out of service until completion of an independent technical review of the final configuration of the UFMS installation. Under consideration is the installation of the UFMS on the common feedwater header or the installation of noise filters on the UFMS installed on the four feedwater lines.

Appropriate Station procedures that are used to obtain UFMS CFs will be revised to include a step to check the UFMS for signal noise, and if noise exists that contaminates the signal, then the UFMS will not be used to establish new CFs.

The UFMS vendor will provide a method and proper tools, which can positively determine if noise that affects the UFMS signals is present.

A communication protocol will be established between the Exelon engineering organizations and the UFMS vendor to improve the working relationship through effective sharing of relevant information.

An evaluation will be conducted to determine if additional training is needed for Exelon personnel involved in the UFMS.

F. Previous Occurrences:

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

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