Exelon Generation Company, LLC
Braidwood Station
35100 South Rt 53, Suite 84
Braceville, IL 60407-9619

www.exeloncorp.com

Exelon Nuclear

March 11, 2005
BW050027

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 2005-001-00, "Incorrect Installation of Flow Element Resulted in Service Water Flow Below the Technical Specification Limit"

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73, "Licensee event report system", paragraph (a)(2)(i)(B). 10 CFR 50.73(a) requires an LER to be submitted within 60 days after discovery of the event; therefore, this report is being submitted by March 14, 2005.

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

Respectfully,

Keith J. Polson
Site Vice President
Braidwood Station

Enclosure: LER Number 2005-001-00

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

JE22

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory 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 and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to infocollects@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 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.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE

Incorrect Installation of Flow Element Resulted in Service Water Flow Below the Technical Specification Limit

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	N/A
1	11	2005	2005	- 001 -	00	03	11	2005	FACILITY NAME: N/A	DOCKET NUMBER: N/A

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Michael Smith, Engineering Director	(815) 417-3800

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	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

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On January 11, 2005, during the removal of a reactor containment fan cooler (RCFC) annubar flow element, it was discovered that the flow element was installed backwards. Because of this, the actual essential service water flow may have been less than the indicated flow.

All other RCFCs at Braidwood Unit 1 and Unit 2 were inspected for similar problems and no discrepancies were found. Based on past surveillance data, there were four occasions where flow readings were determined to be potentially lower than the Technical Specification surveillance limit. This low flow condition was assumed to be present for greater than the Limiting Condition for Operation (LCO) Completion Time for one or more inoperable RCFC trains per LCO 3.6.6, which is seven days. Therefore, the 2A RCFC was determined to be inoperable for greater than the allowed LCO Completion Time per LCO 3.6.6.

The condition of the annubar flow element was determined to exist since original construction. Corrective actions included inspecting the flow elements for all Unit 1 and Unit 2 RCFCs for correct installation. Additionally, a technical evaluation was performed on the annubar flow error as a result of the backward installation to determine the effect of the potential low flow condition on the heat removal capability of the RCFC.

There were no safety consequences impacting plant or public safety as a result of this event.

This event is being reported pursuant to 10 CFR 50.73(a)(2)(i)(B).

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

A. Plant Operating Conditions Before The Event:

Event Date: January 11, 2005 Event Time: 1100

Unit: 2 MODE: 1 Reactor Power: 100 percent

Unit 2 Reactor Coolant System (RCS) [AB] Temperature: 581 degrees F, Pressure: 2235 psig

B. Description of Event:

There were no additional structures, systems or components inoperable at the beginning of the event that contributed to the severity of the event. The 2A reactor containment fan cooler (RCFC) [BK] was out of service and inoperable when the condition was discovered.

On January 11, 2005, contractor pipefitters were removing the RCFC flow element (2FE-SX112) annubar flow element; per a work order to clean and then re-install. During the removal, it was discovered that the annubar flow ports appeared to be located opposite of how they should have been facing.

The system engineer was contacted for review of the flow port positions so proper orientation would be obtained when the annubar was installed after cleaning. The correct flow port orientation was verified for reassembly of the annubar, and the annubar was reinstalled correctly. All other RCFCs at Braidwood Unit 1 and Unit 2 were inspected for similar problems and no discrepancies were found.

The condition of the annubar flow element was determined to exist since original construction. Based on surveillance data for the past three years, there were four occasions where flow readings were determined to be potentially lower than the Technical Specification (TS) surveillance limit. This low flow condition was assumed to be present for greater than the Limiting Condition for Operation (LCO) 3.6.6 Completion Time for one or more inoperable RCFC trains. Therefore, the 2A RCFC was determined to be inoperable for greater than the LCO allowed Completion Time per LCO 3.6.6.

C. Cause of Event

What appeared to be original paint was required to be chipped off the annubar to remove it. Additionally, a review of the equipment part numbers was performed and no data was found to support that this annubar had been worked on since the original installation. Based on this information, it has been determined that this condition existed since original construction. The cause of the incorrect installation of the instrument is unknown.

TS surveillance 3.6.6.3 requires verification every 31 days that essential service water (SX) [BI] flow to each of the RCFCs is greater than or equal to 2660 GPM. This is to ensure that that the design flow rates of 2650 GPM assumed in the safety analysis can be achieved. For the 2A RCFC, flow readings taken from local flow indicators 2FI-SX112 and 2FI-SX122 are added together to determine the total SX flow to the RCFC. During the removal of flow element 2FE-SX112, it was discovered that it was installed backwards. 2FE-SX112 is a pitot tube design (annubar) with four sensing holes on the upstream side to average the transverse pressure, and one opening on the downstream side for measuring the static pressure. Because the flow element was installed backwards, the single static pressure opening was facing the upstream flow and measuring at a transverse point were the pressure would be the greatest, instead of measuring the average pressure. For this reason, the indicated SX flow may have been greater than the actual flow. The vendor technical representative was consulted regarding the potential inaccuracy

associated with installing an annubar in reverse. Based on the vendor's experience with pitot tube transverse testing and engineering judgment, the vendor provided a bounding inaccuracy value for use in evaluating past flow surveillance data. Three years of surveillance data for the readings taken at 2FI-SX112 were examined using the bounding inaccuracy values. The volumetric flow data for all 51 surveillance points were adjusted lower and the total volumetric flow was calculated. Of the 51 total flow data points, four were determined to be potentially lower than the TS surveillance limit of 2660 GPM. The four points are as follows:

Date	Surveillance	Adjusted Flow (GPM)
10/28/03	2BwOSR 3.6.6.2	2608
2/22/04	2BwOSR 3.6.6.2	2650
2/23/04	2BwOSR 3.6.6.2	2587
4/27/04	2BwOSR 3.6.6.2	2623

As noted, the lowest SX flow is 2587 GPM. The deviation from the required greater than or equal to 2660 GPM flow rate is 73 GPM (less than 3% of the required flow).

D. **Safety Consequences:**

There were no safety consequences impacting plant or public safety as a result of this event. The low flow would have resulted in negligible effect on RCFC performance.

Each one of four RCFCs per unit is required to remove a heat load of 1,670,000 BTU/hr. The nameplate cooling capability of each RCFC is 1,970,000 BTU/hr. Thus, there is a margin of about 18% between the required capability and nameplate capability of the RCFCs. Thermal performance testing of the RCFCs has demonstrated heat removal capability greater than or equal to nameplate cooling capability. Therefore, the actual capability of the RCFCs exceeds the required heat removal capability by at least 18%.

Sensitivity studies have shown that a 10% reduction in SX flow will reduce the heat removal capability of an RCFC by less than 0.3%. For the identified deviation of less than 3% of the required flow, the reduction in heat removal capability would be even less.

The design basis analysis assumes an SX water temperature of 100 degrees F. For each of the occasions indicated above, the actual lake temperature was well below the 100 degrees F design temperature (less than 75 degrees F). This cooler lake temperature significantly increases the thermal performance capabilities of the heat exchanger (conservatively estimated to double the heat removal capability of the RCFC).

Based on the margins available, the flow deviation had a negligible effect on the heat exchanger performance. The heat removal capability of the RCFC exceeded the required capability during the four occasions where SX flow may have been less than the required 2660 GPM.

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

E. **Corrective Actions:**

The annubar flow elements for all Unit 1 and Unit 2 RCFC flow elements were inspected for correct installation. No other deficiencies were noted. Additionally, a technical evaluation was performed on the annubar flow error as a result of the backward installation to determine the effect of the potential low flow condition on the heat removal capability of the RCFC, and concluded there was a negligible effect on RCFC performance.

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

F. Previous Occurrences:

There have been no similar Licensee Event Report events at Braidwood Station in the last three years.

G. Component Failure Data:

Manufacturer	Nomenclature	Model	Mfg. Part Number
N/A	N/A	N/A	N/A