



Exelon Generation Company, LLC      www.exeloncorp.com  
Braidwood Station  
35100 South Route 53, Suite 84  
Braceville, IL 60407-9619

10 CFR 50.73

April 28, 2016  
BW160030

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

Braidwood Station, Units 1 and 2  
Renewed Facility Operating License Nos. NPF-72 and NPF-77  
NRC Docket Nos. STN 50-456 and STN 50-457

Subject: Licensee Event Report 2016-001-00 – Auxiliary Feedwater Diesel Intake Design  
Deficiency Related to Turbine Building High Energy Line Break Resulted in an  
Unanalyzed Condition Due to Insufficient Validation of Vendor Analysis Inputs

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73,  
"Licensee Event Report System."

There are no regulatory commitments contained in this letter. Should you have any questions  
concerning this submittal, please contact Mr. Steven Reynolds, Regulatory Assurance Manager, at  
(815) 417-2800.

Respectfully,

A handwritten signature in black ink, appearing to read "Marri Marchionda-Palmer".

*MP*  
Marri Marchionda-Palmer  
Site Vice President  
Braidwood Station

Enclosure: LER 2016-001-00

cc: NRR Project Manager – Braidwood Station  
Illinois Emergency Management Agency – Division of Nuclear Safety  
US NRC Regional Administrator, Region III  
US NRC Senior Resident Inspector (Braidwood Station)  
Illinois Emergency Management Agency – Braidwood Representative



**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@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.

**1. FACILITY NAME**

Braidwood Station, Unit 1

**2. DOCKET NUMBER**

05000456

**3. PAGE**

1 OF 4

**4. TITLE**

Auxiliary Feedwater Diesel Intake Design Deficiency Related to Turbine Building High Energy Line Break Resulted in an Unanalyzed Condition Due to Insufficient Validation of Vendor Analysis Inputs

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
03	04	2016	2016	001	00	04	28	2016	Braidwood Station, Unit 2	05000457
									N/A	N/A

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

1	<input type="checkbox"/> 20.2201(b)	<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)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. POWER LEVEL	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<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)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A	

**12. LICENSEE CONTACT FOR THIS LER**

LICENSEE CONTACT Steven Reynolds, Regulatory Assurance Manager	TELEPHONE NUMBER (Include Area Code) (815) 417-2800
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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**

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

**15. EXPECTED SUBMISSION DATE**

MONTH	DAY	YEAR
N/A	N/A	N/A

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

On March 4, 2016, during the NRC Component Design Basis Inspection, a concern was raised regarding why it was acceptable for the diesel driven auxiliary feedwater (AF) pump engine combustion air intake to be located in the turbine building, a non-safety related structure. On March 6, 2016, the additional evaluations that were completed determined that the existing configuration did not adequately support diesel engine operation with high energy line break (HELB) conditions in the turbine building, and at 2000 hours, Operations entered Technical Specification Limiting Condition for Operation 3.7.5, "Auxiliary Feedwater (AF) System," Condition A, "One AF train inoperable," for one train (B-train) of AF inoperable for both Units 1 and 2. The AF trains were declared operable following a corrective action to install a temporary configuration change to provide engine combustion air intake from the auxiliary building.

The cause of the event was insufficient validation of vendor analysis inputs in 1993 while reviewing the AF diesel engine's ability to function during a turbine building HELB event.

The corrective actions planned are to develop and install a permanent modification to re-route the AF diesel engine intakes for Unit 1 and 2.

NRC FORM 366A  
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104

EXPIRES: 10/31/2018



## LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Braidwood Station, Unit 1	05000456	2016	- 001	- 00

### NARRATIVE

#### A. Plant Operating Conditions Before the Event:

Event Date: March 4, 2016

Unit: 1 Mode: 1 Reactor Power: 100 percent  
Unit: 2 Mode: 1 Reactor Power: 100 percent

Unit 1 Reactor Coolant System (RCS) [AB]: Normal operating temperature and pressure  
Unit 2 Reactor Coolant System: Normal operating temperature and pressure

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

#### B. Description of Event:


On March 4, 2016, during the NRC Component Design Basis Inspection, a concern was raised regarding why it was acceptable for the diesel-driven auxiliary feedwater (AF) [BA] pump engine combustion air intake to be located in the turbine building, a non-safety related structure. Combustion air intake draws air from the turbine building via an intake pipe that enters the safety-related auxiliary building to the AF diesel-driven pump room.

On March 6, 2016, during the review of documentation related to the combustion air intake, it was identified that the existing configuration did not adequately support diesel engine operation with high energy line break (HELB) environmental conditions in the turbine building. Prior evaluations did not fully account for the combustion air being a steam-air mixture in a post-HELB environment that reduces the available air density during the event.

On March 6, 2016 at 2000 hours, Operations entered Technical Specification (TS) Limiting Condition for Operation (LCO) 3.7.5, "Auxiliary Feedwater (AF) System," Condition A, "One AF train inoperable," for one train (B-train) of AF inoperable, for both Units 1 and 2. NRC Event Notification (ENS) 51771 was made on March 7, 2016 at 0100 CST.

A temporary configuration change was implemented to provide engine combustion air intake from the auxiliary building. The change allowed air from the AF diesel-driven pump rooms to supply the Unit 1 and Unit 2 AF diesel engines and a wire mesh screen cap was installed to prevent incidental intrusion of debris that could be present in the proximity of the air intake. On March 7, 2016, following the installation of changes, the AF trains were declared operable. Additionally, compensatory measures were implemented to 1) monitor for a potential radioactive material release from the engine exhaust to the atmosphere, and 2) institute a fire watch due to the configuration change disabling the CO2 system and opening the doors for the AF diesel-driven pump rooms.

This condition is reportable in accordance with 10CFR50.73(a)(2)(ii)(B), any event or condition that results in the nuclear power plant being in an unanalyzed condition that significantly degrades plant safety. Additionally, TS LCO 3.7.5 Condition A requires restoring the AF train to OPERABLE status within 72 hours. As the AF combustion air intake was installed per the original plant design, this condition existed for a longer period of time than is allowed by LCO 3.7.5 Condition A. Therefore, this event is also being reported pursuant to 10 CFR 50.73(a)(2)(i)(B), any operation or condition which was prohibited by TSs. Further, as there were multiple times during the past three years where the Unit 1 and Unit 2 A-train AF system were inoperable for surveillance testing, this event is also being reported pursuant to 10 CFR 50.73(a)(2)(v)(B) as a condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to remove residual heat.

NRC FORM 366A (11-2015)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB: NO. 3150-0104		EXPIRES: 10/31/2018	
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Braidwood Station, Unit 1		05000456		YEAR	SEQUENTIAL NUMBER	REV NO.	
				2016	- 001	- 00	
<b>NARRATIVE</b>							
<b>C. Cause of Event</b>							
<p>The cause of the condition of inadequate combustion air available for AF diesel engine operation during a main feedwater (FW) [SJ] HELB was insufficient validation of vendor analysis inputs in 1993 while reviewing the AF diesel engine's ability to function during a HELB event. The technical error originated from the AF diesel engine manufacturer. An engineering product that was completed in 1993 utilized the vendor input as a fact and did not perform any independent reviews or analysis to verify the vendor's conclusion.</p>							
<b>D. Safety Consequences:</b>							
<p>This condition had no actual safety consequences impacting plant or public safety since Braidwood Station has not experienced a turbine building HELB event.</p>							
<p>During a postulated design basis FW HELB event in the turbine building, the diesel-driven AF pump may not be functional due to the lack of oxygen available at the combustion air intake located in the turbine building. Included in the design basis event is a single active failure of the motor-driven A-train AF pump which would result in the loss of safety function of the AF system. During this postulated event, the RCS would heat up and the resultant volume expansion would begin filling the pressurizer. Station procedures include steps to restore AF flow or a non-safety related water supply to the secondary-side of the steam generators. If all attempts to restore a secondary heat sink are unsuccessful, "feed and bleed" operations would be implemented to cool the RCS while secondary heat sink restoration efforts continued.</p>							
<p>The adverse turbine building conditions would be present for a limited duration based on the finite volume in the secondary water systems and the ability to manually isolate a postulated pipe break. As the turbine building conditions return to normal, air would become available at the diesel-driven AF pump combustion air intake and AF flow would be restored to the steam generators if required.</p>							
<p>This event has a low safety significance based on the historical availability of the A-train AF pump, the limited population of secondary pipe breaks (low probability of occurrence) which would adversely affect the B-train AF pump, and the ability to restart the B-train AF pump when the turbine building conditions return to normal.</p>							
<b>E. Corrective Actions:</b>							
<p><u>Interim Corrective Actions Completed</u> – A temporary configuration change was completed to provide engine combustion air intake from the auxiliary building, and install a wire mesh screen cap to prevent incidental intrusion of debris into the air intake. Additionally, compensatory measures were implemented to monitor for a potential radioactive material release from the engine exhaust to the atmosphere and to institute a fire watch due to the configuration change disabling the CO2 system and opening the doors for the AF diesel rooms.</p>							
<p><u>Corrective Actions planned</u> – Develop and install a permanent modification to re-route the AF diesel engine intakes for Unit 1 and 2.</p>							

NRC FORM 366A  
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

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CONTINUATION SHEET**

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Braidwood Station, Unit 1	05000456	2016	- 001	- 00

**NARRATIVE**

**F. Previous Occurrences:**

There have been no previous Licensee Event Reports at Braidwood on this issue.

**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