

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

www.exeloncorp.com

10 CFR 50.73

February 17, 2009  
BW090018

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

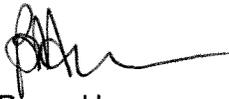
Braidwood Station, Units 1 and 2  
Facility Operating License Nos. NPF-72 and NPF-77  
NRC Docket Nos. STN 50-456 and STN 50-457

Subject: Licensee Event Report 2008-001-00, "Technical Specification Non-Compliance Due to Inadequate Design of Auxiliary Feedwater (AF) Tunnel Access Covers Causing AF Valves Within the Tunnel to be Inoperable"

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) as a condition prohibited by the plant's Technical Specifications (TS). On December 16, 2008, Braidwood Station determined that certain valves relied upon for a containment isolation function were potentially inoperable from original construction until temporary modifications were installed on Auxiliary Feedwater (AF) tunnel access covers in the summer of 2008, which is longer than allowed by TS 3.6.3 Condition C. 10 CFR 50.73(a) requires an LER to be submitted within 60 days following discovery of the event. Therefore, this report is being submitted by February 17, 2009.

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

Respectfully,



Bryan Hanson  
Site Vice President  
Braidwood Station

Enclosure: LER Number 2008-001-00

**LICENSEE EVENT REPORT (LER)**

(See reverse 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 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.

<b>1. FACILITY NAME</b> Braidwood Station, Unit 1	<b>2. DOCKET NUMBER</b> 05000456	<b>3. PAGE</b> 1 OF 5
--	-------------------------------------	--------------------------

**4. TITLE**  
Technical Specification Non-Compliance Due to Inadequate Design of Auxiliary Feedwater (AF) Tunnel Access Covers Causing AF Valves Within the Tunnel to be Inoperable

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
12	16	2008	2008	001	00	02	17	2009	Braidwood Station, Unit 2	05000457
									N/A	N/A

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> (Check all that apply)									
	<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)						
<b>10. POWER LEVEL</b>  100	<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"/> 50.73(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"/> 50.73(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 type="checkbox"/> OTHER							
<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)(v)(D)	Specify in Abstract below or in NRC Form 366A							

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME David Gullott, Regulatory Assurance Manager	TELEPHONE NUMBER (Include Area Code) (815) 417-2800
--	--

**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

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

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

In July 2007, it was identified that a 1987 calculation, detailing available design margin associated with the Auxiliary Feedwater (AF) tunnel access covers, did not account for forces from a Main Steam (MS) line High Energy Line Break (HELB). The calculation scope was limited to loading expected during a station-flooding event. The load from an MS HELB is greater than the load from a station flood. Also, the identified margin for installed concrete expansion anchors was less than the design standard, which requires a Factor of Safety (FOS) greater than or equal to 4.0, yet no actions were taken to recover the desired design margin.

An Operability Evaluation was performed which supported operability of the covers using a FOS of 1.0. However, on December 16, 2008, it was determined that use of a FOS of 1.0 for operability could not be supported and the AF tunnel flood seal opening covers were considered to have been inoperable from original construction until temporary modifications were installed in the summer of 2008 to regain margin.

The cause of this condition was an inadequately designed component during original construction. An investigation was conducted but could not determine why the 1987 calculation did not consider HELB forces nor document the design standard non-compliance into a Corrective Action Program. Completed corrective actions include installation of temporary and permanent modifications to regain margin and restore compliance with design standards, respectively.

There were no actual 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), as a condition prohibited by Technical Specifications 3.6.3 Condition C.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Braidwood, Unit 1	05000456	YEAR	SEQUENTIAL NUMBER	REV NO.	2    OF    5
		2008	-	001	

**NARRATIVE**

**A. Plant Operating Conditions Before The Event:**

Event Date: December 16, 2008  
Event Time: 15:00

Unit 1 and Unit 2 were in Mode 1 – Power Operations

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

**Background:**

The Auxiliary Feedwater (AF) [BA] tunnel is located directly below the Main Steam (MS) [SB] tunnel and houses AF piping and the AF Pump Discharge Header to Steam Generator Isolation Valves (i.e., AF013). The AF013 valves are normally open valves that provide an AF flow path to the Steam Generators (SG), but are also considered Containment [NH] isolation valves. Access to the AF tunnels is provided by openings in the floors of the MS Isolation and Safety Valve Rooms. These openings have access covers. There is one AF tunnel on each unit, each with four access covers. Since the AF013 valves are not environmentally qualified, the purpose of the access covers is, in part, to provide environmental protection.

In October 1987, a calculation was performed to evaluate the adequacy of the subject AF tunnel access covers' as-built condition. This calculation only considered flooding loads on the Concrete Expansion Anchors (CEA) used to support the AF tunnel access covers. The purpose of this calculation was to determine the Factor of Safety (FOS) of the Ultimate Strength of the flood covers installed over the AF tunnels. The FOS is the ratio of the ultimate load capacity of the CEA to its anticipated design load. It is noted that the Sargent & Lundy construction design standards utilized for Braidwood station (ref. SDS-E11.0) required a FOS of at least 4.0 for all CEAs.

This calculation identified that some of the CEAs supporting the covers had a FOS less than 2.0, but greater than 1.0. The installed CEAs did not meet the 300% margin (i.e., FOS of 4.0) required by the design standard. No apparent actions were taken at the time to address the low margin identified or for the non-compliance with the design standard of a FOS of 4.0.

**B. Description of Event:**

There were no structures, systems, or components inoperable at the beginning of the event that contributed to the severity of the event.

On April 4, 2007, an Engineer at Byron (Braidwood's sister plant), after reviewing the 1987 calculation, recognized a potential discrepancy in that the AF tunnel access covers were designed for flood loads but not High Energy Line Break (HELB) loads. At this time, it was not clear if the cover was required to be designed for HELB loads.

Between April and July 2007, investigations continued into the design basis of the AF tunnel access covers to determine what plant events the covers should be designed to withstand. On July 26, 2007, it was concluded that the AF tunnel covers were required to withstand a station flood and a HELB from the MS Lines above the AF tunnel. The differential pressure exerted on the AF tunnel access covers during the HELB is higher than that experienced during a station flood. As a result, the FOS for the installed CEAs were actually lower than previously calculated in 1987 and an operability evaluation was performed.

The operability evaluation concluded the AF tunnel access covers were sufficiently designed to support operability of AF013 valves. The FOS's were reduced but still greater than 1.0 (i.e., use of a FOS of 1.0 was deemed to be acceptable for operability). NRC documents providing FOS guidance (Inspection and Enforcement (IE) Bulletin

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Braidwood, Unit 1	05000456	YEAR	SEQUENTIAL NUMBER	REV NO.	3	OF 5
		2008	- 001	- 00		

**NARRATIVE**

79-02 and Supplement 1 to IE 79-02) were determined to be not applicable to this design application. The AF013 valves in the tunnel were considered operable and actions were initiated to perform permanent modifications to restore the CEAs to the desired design FOS of 4.0 as specified in the design standard.

In June of 2008, two discrepancies were discovered with the 2007 Operability Evaluation. An NRC Inspector discovered the evaluation did not include a Dynamic Loading Factor (DLF) to account for the energy imparted to the cover as a result of the sudden pressurization of the MS tunnel during a HELB. Additionally, it was self-identified that the MS tunnel ventilation blow-out panels were not installed per design. The existing MS HELB analysis was performed with the assumption that panels in the MS Isolation Valve rooms would blow out during the HELB to relieve room pressure. Inspections of the panels led to a conclusion that they would not blow out to relieve pressure as expected. This would result in an increase in room pressure. Therefore, the decision was made to install temporary modifications to modify the blow-out panels in order to provide additional pressure relief paths and to install strongbacks on the AF tunnel access covers to regain some margin pending the installation of the permanent modifications to provide a FOS greater than 4.0. The temporary modifications were installed by July of 2008.

In this timeframe, a complex analysis was begun to assess operability of the AF013 valves from a historical perspective. The conclusion was the access covers would perform their functions and protect the operability of the AF013 valves. This was based on the FOS continuing to be greater than 1.0. This conclusion was also based on an unverified assumption that each access cover had four CEAs. This assumption was to be verified the next time the access covers were removed.

In the Fall 2008 Byron Unit 2 refuel outage, the access covers were removed and it was determined that some of the access covers had only three CEAs. During installation of the permanent modifications, the same configuration was found to exist at Braidwood for a single access cover. A subsequent evaluation recommended not performing a re-analysis given the already low margin condition that existed, assuming the absence of the temporary modifications. This recommendation came after it was determined that use of a FOS of 1.0 to demonstrate operability was not supported. Consequently, on December 16, 2008, it was determined that it was possible that one or more of the AF tunnel covers may have been insufficiently designed to withstand a design basis HELB outside of containment for a time period covering date of original construction until temporary modifications were installed in the summer of 2008. This would have impacted the AF013 valves ability to perform their containment isolation function (i.e., to close), and would therefore render them inoperable during the applicable design basis event (MS Line Break outside of containment).

This potential historical condition is reportable to the NRC in accordance with 10 CFR 50.73(a)(2)(i)(B), as a condition prohibited by Technical Specifications 3.6.3 Condition C.

**C. Cause of Event**

The cause of this condition was an inadequately designed component during original construction.

An investigation could not determine why the 1987 calculation did not consider HELB forces nor identify the FOS less than 4.0 non-compliance into the Corrective Action Program.

**D. Safety Consequences:**

There were no actual consequences from the condition since an HELB did not occur while the AF tunnel access covers had minimal structural margin.

To assess the potential consequences of AF tunnel access cover failures, the function of the equipment protected by the access covers (i.e., AF013s) must be considered. From a review of the Updated Final Safety Analysis Report (UFSAR) and Technical Specifications, the AF013s have the following design functions:

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Braidwood, Unit 1	05000456	YEAR	SEQUENTIAL NUMBER	REV NO.	4	OF 5
		2008	- 001	- 00		

**NARRATIVE**

1. Containment Isolation valves,
2. Maintain an AF flowpath to the SGs for heat removal,
3. Isolation of AF to the SGs during a SG Tube Rupture, and
4. Isolation of AF for secondary side piping breaks on the SGs.

For the first three functions the AF013s would not be affected because the initiating events are inside containment and do not result in pressurization of the AF tunnel access covers. Therefore, there was no challenge to the ability of the AF013 valves from performing these design functions.

Isolation of AF for secondary side breaks is desired primarily to limit mass and energy releases from the SGs and minimize reactivity effects of excessive RCS cooldown. For secondary side breaks inside containment, the rationale for the first three functions also applies (i.e., a secondary side break in containment will not result in pressurization of the AF tunnel covers).

For secondary side breaks outside containment, continued release of energy could damage safety related components in the MS Isolation and Safety Valve room. However these components have either already performed their safety function (MS Isolation Valve closure, detection of low steam line pressure) or are not needed for accident diagnosis or mitigation in conjunction with a steam line break outside containment (MS line radiation monitors).

Isolation of AF flow is not credited in the UFSAR for steam line breaks. Essentially, the event is terminated when boron reaches the core within the first few minutes of the accident. For Main Feedwater (FW) [SJ] line breaks, the UFSAR does assume isolation of AF flow at 20 minutes after the event; however, the energy release from an FW line break is substantially less than that from an MS line break. Therefore, the AF tunnel covers are designed not to fail and the AF013s will remain available for their isolation function.

Based on the above, the low structural margin of the AF tunnel access covers on the AF013s did not have adverse actual or potential consequences on the AF013 valves' ability to perform their containment isolation valve function.

There were no safety system functional failures as a result of this event.

**E. Corrective Actions:**

Corrective actions include:

1. Completed installation of temporary modifications in the summer of 2008 to regain some design margin.
2. Completed installation of permanent modifications (final Braidwood modification, for both Units 1 and 2, completed on 1/2/09) to restore compliance with design standards (i.e., FOS greater than or equal to 4.0).
3. Communications of the event to selected personnel.
4. Completed training request for engineering personnel for the lessons learned from this event.
5. Enhancements to the Operational and Technical Decision Making (OTDM) process. Specifically, utilize the OTDM process to document issues like low margin (operational risk exposure) that are beyond the scope of an Operability Evaluation.
6. Review existing station practices associated with recurring review of open Operability Evaluations to identify opportunities to incorporate lessons learned from this event, including confirmation of appropriate prioritization of corrective actions.

**F. Previous Occurrences:**

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

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE		
Braidwood, Unit 1	05000456	YEAR	SEQUENTIAL NUMBER	REV NO.	5	OF	5
		2008	- 001	- 00			

**NARRATIVE**

**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