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

www.exeloncorp.com

Exelon Nuclear

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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

Subject: Submittal of Supplemental Licensee Event Report Number 2003-001-01, "Control Room Ventilation System Alignment Results in Inoperable Radiation Monitors Without Taking Required Actions per the Technical Specifications due to inadequate evaluation of the original procedures and some subsequent revisions and inadequate evaluation of a design change."

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). This LER is a supplement to LER 2003-001-00 which was submitted on March 28, 2003. At the time of LER 2003-001-00 submittal, an engineering evaluation was in progress to determine whether this event constituted a safety system functional failure in accordance with 10 CFR 50.73, paragraph (a)(2)(v)(D). The results of the engineering evaluation are discussed in the supplemental LER.

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 2003-001-01
cc: Regional Administrator – Region III
NRC Braidwood Senior Resident Inspector

IE22

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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.

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Braidwood, Unit 1	STN 05000456	1 of 5

4. TITLE

Control Room Ventilation System Alignment Results in Inoperable Radiation Monitors Without Taking Required Actions per the Technical Specifications due to inadequate evaluation of the original procedures and some subsequent revisions and inadequate evaluation of a design change.

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
01	27	2003	2003	-001-	01	05	23	2003	Braidwood Unit 2	STN 05000457
									FACILITY NAME: Byron Station	DOCKET NUMBER: STN 05000454

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)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 73.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 73.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A
☐	☐	☐	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Mike Smith, System Engineering Manager	(815) 417-2243

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	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	MONTH	DAY	YEAR
	Yes (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

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

On January 27, 2003 it was determined that the Unit Common Control Room Ventilation System (VC) Filtration System Actuation Instrumentation (FSAI) radiation monitors were not operable when VC was aligned to the Turbine Building makeup air intake. The radiation monitors are located in the outside air makeup intake. On a high radiation signal, VC is realigned to the Emergency Makeup Mode. Some VC operating and surveillance procedures allow operation of the VC System with alignment to the Turbine Building makeup air intake resulting in an inoperable FSAI system since the system is incapable of performing its design function in this configuration due to there being no outside air flow past the radiation monitors. The applicable Technical Specification Limiting Condition for Operation has historically not been entered for this condition. This issue has existed since initial licensing of the facility. In addition, during the investigation a design flaw was discovered in that the automatic shutdown of ventilation systems that may contribute to unfiltered air in-leakage to the control room was improperly removed from the Engineered Safety Feature Safety Injection (ESF-SI) actuation signal.

The root causes for the event were inadequate evaluation of the original operating and surveillance procedures and subsequent revisions and inadequate evaluation of a design change. The condition is considered to have minimal safety consequences.

This event is being reported pursuant to 10CFR50.73(a)(2)(i)(B).

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

Unit: 1 Event Date: 1/27/2003 Event Time: 0433

MODE: 1 Reactor Power: 100 percent

Reactor Coolant System (RCS) [AB] Temperature: 580 degrees F, Pressure: 2235 psig

B. **Description of Event:**

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

At 0433 on 1/27/2003, the 0B train of the Control Room Ventilation System (VC) [VI] Makeup Filter Unit was being placed into operation for the monthly operability surveillance. During the evolution, one of the normal outside air dampers closed very slowly. Based on the slow damper closure a Technical Specification (TS) Limiting Condition for Operation (LCO) was entered for the 0B VC train and the 0B VC train was placed in the Emergency Makeup Mode in accordance with the TS LCO Required Actions. Operations discussed with Engineering the required lineup for placing the 0B VC train in the Emergency Makeup Mode. While reviewing the lineup requirements, Engineering questioned the operability of the outside air radiation monitors when VC was aligned to the Turbine Building intake. A Condition Report (CR) was written to enter the question into the Corrective Action Process (CAP) for resolution. During the CR investigation, it was determined that the operability of the outside air radiation monitors could not be verified when VC is aligned to the Turbine Building makeup air intake and that the Filtration System Actuation Instrumentation (FSAI) should be declared inoperable and the applicable LCO entered. It was then recognized that the VC System Makeup Filter Unit was placed in service with the Turbine Building air intake aligned monthly for VC surveillance requirements and periodically to support other plant evolutions without entering the applicable LCO for an inoperable channel of VC FSAI.

During normal operation of the VC System, one of two trains of VC is in operation. Normal VC makeup is taken from outside air. Two radiation channels are located on the outside air intake of each VC train. On a high radiation signal from one of the radiation channels, an actuation signal is generated to shift the VC System to the Emergency Makeup Mode and to shut down the Miscellaneous/Shift Office Ventilation (VV) [XX], Laboratory Ventilation (VL) [XX] and Radwaste Building Ventilation (VW) [XX] Systems. Ducting for these ventilation systems is routed through the Control Room boundary. In lieu of performing leakage testing on these systems, interlocks were added to the design to shut down the systems as described. The Emergency Makeup Mode consists of starting the makeup fan, which draws air through the Makeup Filter Unit from the Turbine Building makeup air intake, isolating the normal outside air intake, and placing the Recirculation Charcoal Adsorber in operation. In response to an Engineered Safety Feature Safety Injection (ESF-SI) [JE] actuation signal, the VC system will reconfigure to the Emergency Makeup Mode as described above, except that the VV, VL and VW systems are not shut down.

Monthly, each VC train is manually aligned to place the Makeup Filter Unit in operation for a 10-hour surveillance required per Technical Specifications. For the surveillance, the VC system is operated with the Makeup Filter Unit on line for 10 hours without the Recirculation Charcoal Adsorber operating and for 15

minutes with the Recirculation Charcoal Adsorber operating. In addition to the surveillance requirement, the VC System can be manually aligned to the Turbine Building makeup air intake to support other various station activities. The VC System is manually aligned to the Turbine Building makeup air intake in accordance with approved procedures. When manually aligning the VC System, the Makeup Filter Unit is placed in operation, but the Recirculation Charcoal Adsorber is typically not placed in operation. The VV, VL and VW systems are not shut down when the VC System is manually aligned to the Turbine Building intake. A review of operator logs identified numerous instances over the last 3 years where the VC System was aligned in this manner.

During the review of the VC System alignment, a design issue was also identified with the ESF-SI actuation signal for isolating the Control Room environment. Duct leakage testing of the VV, VL and VW systems was not performed. These systems were required to be shut down because no in-leakage was assumed from these systems in the original Control Room habitability calculation. The VV, VL and VW control logic was modified during construction to shut down these systems on a high radiation signal from the VC outside air radiation monitors or from an ESF-SI actuation signal. A subsequent change was made to remove the shut down of the VV, VL and VW systems on an ESF-SI signal to eliminate nuisance trips of the systems from spurious ESF-SI actuation signals. However, since the radiation monitors were made inoperable as the result of realignment of the VC System to the Emergency Makeup Mode following an ESF-SI actuation signal, then a shut down of the VV, VL and VW systems would not be initiated if high outside air radiation occurs after the ESF-SI actuation. The Emergency Operating Procedures do not provide direction to the operator to shut down the VV, VL and VW systems unless the radiation monitors are above the alarm setpoint. Since the radiation monitors may not be sampling outside air, they may not be in alarm and the operators would not initiate manual action to shut down the systems following an ESF-SI actuation. Failure to shut down the VV, VL and VW systems could result in unfiltered leakage to the Control Room. Excessive unfiltered in-leakage could result in higher dose to Control Room personnel than previously analyzed.

In summary, two conditions were identified at Braidwood:

1. Surveillance and operating procedures were used to align the VC System to the Turbine Building makeup air intake. In this configuration the outside air radiation monitors were inoperable since there was no outside airflow past the monitors. However, these procedures did not address the inoperability of the outside air radiation monitors (VC Filtration System Actuation Instrumentation channel) nor did they specify entering the applicable LCO.
2. The ESF-SI actuation logic associated with Control Room Ventilation isolation would realign the VC Filtration system to Emergency Makeup Mode, but did not initiate shutdown of the VV, VL and VW systems. Therefore, the ESF-SI actuation logic would not provide for full Control Room Ventilation isolation following an ESF-SI signal as analyzed in the Control Room habitability calculation.

When Operating and Surveillance procedures were developed for the VC System beginning in 1984, the possible inoperability of the VC Filtration System Actuation Instrumentation while aligned to the Turbine Building makeup air intake was not documented. When the design change was issued to revise the control logic for the VV, VL and VW systems to eliminate shutting down the systems on an ESF-SI actuation signal, the modification documentation did not

provide justification for why the elimination of the ESF shutdown of the VV, VL and VW systems was acceptable.

This condition is reportable to the NRC in accordance with 10CFR 50.73(a)(2)(i)(b) as a condition prohibited by Technical Specifications.

C. **Cause of Event**

Two root causes were identified for the event.

1. Inadequate evaluation of the original procedures and subsequent revisions. Individuals performing the evaluation of the original procedures failed to either adequately identify or correctly evaluate the impact the VC System alignment had on the radiation monitors.

2. Inadequate evaluation of the design change to remove the ESF-SI actuation signal to shut down the VV, VL and VW Systems. Individuals performing the evaluation of the design changes failed to either adequately identify or correctly evaluate the impact the VC System alignment had on the radiation monitors.

D. **Safety Consequences:**

The consequences of this event are minimal. All of the issues are associated with alignment of the VC System to the Makeup Filter Unit. In this configuration, all makeup air to the Control Room is processed through the Makeup Filter Unit which includes a charcoal filtration bank. Upon initiation of an ESF-SI actuation, which would precede most accidents that would release radioactivity to the outside air, the VC Filtration system would align to the Emergency Makeup Mode if makeup air had been from the Turbine Building makeup air intake. However, since the radiation monitors are not sampling outside air, they may not be in alarm and the operators might not initiate manual action to shut down the VV, VL and VW systems following an ESF-SI actuation. Failure to shut down the VV, VL and VW systems could result in an increase in unfiltered leakage to the Control Room envelope. However, the CR habitability analysis includes substantial margin for unfiltered in-leakage. Based on engineering judgment, the margin used in the habitability calculation is sufficient to accommodate any potential increase in the leakage into the VC return duct resulting from the failure to shut down VV, VL and VW.

For accidents that do not assume an ESF-SI actuation the Recirculation Charcoal Adsorber would not have been aligned for operations. If there were a buildup of radiation in the Control Room, the Control Room area radiation monitors would alarm and alert the operators to take actions and place the Recirculation Charcoal Adsorber on line. An engineering evaluation concluded that the VC system would have prevented doses to Control Room personnel from exceeding General Design Criteria 19 limits. Therefore, this event did not constitute a Safety System Functional Failure.

E. **Corrective Actions:**

Interim corrective actions have been initiated to address manual alignment of the VC System to the Turbine Building intake. Equipment Status Tags were placed on the control switches for the affected VC components to specify entry into the

LCO for an inoperable FSAI system when the VC System is aligned to the Turbine Building intake.

The current evaluation processes used for design changes and procedure development and revisions are significantly more rigorous than the processes that were in place when the issues occurred.

Procedures and Training & Reference Material (T&RMs) have been developed to provide better guidance to improve the depth, quality and documentation associated with the development and review of design changes. Improved requirements for documentation associated with design changes facilitate the reviewer in performing a more comprehensive review. Nuclear Engineering Standards (NESs) have been developed to provide a standardized approach to design activities.

Similarly, improvements in the process for the development or revision of procedures have been made. For example, a standardized procedure for the development and control of procedures has been implemented. The procedure provides steps for determining the technical and regulatory reviews required for the procedure change activity. Further the standardized writers guide strengthens the ties to the 10CFR 50.59 evaluation process.

The 10CFR 50.59 resource manual provides individuals with a comprehensive tool for conducting evaluations of design changes or procedures. The expectations in the standards of performance and qualification have also increased in order to improve the quality of the evaluations and reviews.

Procedure changes for the affected procedures are in progress to specify entry into the applicable TS LCO for the VC Filtration System Actuation Instrumentation radiation monitors when the VC System is aligned to the Turbine Building air intake. Procedure changes are also in progress to address the manual actions that are required to shut down the VV, VL and VW systems in response to an ESF-SI actuation signal.

F. **Previous Occurrences:**

There were no previous occurrences identified.

G. **Component Failure Data:**

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