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10 CFR 50.73

May 7, 2010
BW100048

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: Supplemental Licensee Event Report 2009-002-01 – Safety Injection System Containment Sump Isolation Valve 1SI8811B Failed to Stroke Full Open Due to Torque Switch Assembly Corrosion

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), and paragraph (a)(2)(v)(B) as a condition that prevented the fulfillment of a system's safety function. On June 24, 2009, safety injection system containment sump isolation valve 1SI8811B failed to stroke full open during surveillance testing due to corrosion of the valve's torque switch assembly. This LER is a supplement to LER 2009-002-00 which was submitted on August 24, 2009. This supplement contains updated information regarding the safety significance, cause and corrective actions of the issue.

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

Respectfully,

Amir Shahkarami
Site Vice President
Braidwood Station

Enclosure: LER 2009-002-01

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)

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010

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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Safety Injection System Containment Sump Isolation Valve 1SI8811B Failed to Stroke Full Open Due to Torque Switch Assembly Corrosion

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
06	24	2009	2009	- 002 -	01	05	07	2010	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

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Ron Gaston, Regulatory Assurance Manager	(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
B	BP	Torque Switch	L200	Yes	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 June 24, 2009, safety injection system containment sump isolation valve 1SI8811B was stroked open for surveillance testing. The 1SI8811B control board indication went dual, but never indicated full open. Locally 1SI8811B was observed approximately 30 to 40 percent open. Investigation found water in the actuator limit switch (LS) compartment, and it was determined the actuator torque switch (TS) for the 1SI8811B was corroded and non functional. The cause of the corrosion was determined to be water intrusion into the LS compartment through the conduit connector from a leaking overhead area roof removable slab. The TS and LS finger bases were replaced. On June 26, 2009 at 02:42 hours, the valve was restored to operable status.

The root cause was determined to be that station personnel did not fully understand that the area design configuration did not incorporate water tight electrical components to prevent water intrusion, resulting in a lack of sensitivity to the effects of water spills, sprays or leaks in the area. Corrective actions include replacing the TS and LS finger bases, cleaning and drying the wires and LS compartment on 1SI8811B, and repair of the area roof removable concrete slab area in accordance with design drawings. Corrective actions to prevent recurrence include providing training to applicable personnel on the general design configurations and the need to ensure proper controls involving water within specific equipment qualification zones, and developing and implementing processes and controls to evaluate electrical components affected by potential water intrusion in safety related areas.

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) and 10 CFR 50.73(a)(2)(v)(B). Failure of 1SI8811B to fully open prevented 1SI8804B, Residual Heat Removal to Safety Injection, and 1CS009B Containment Spray Pump 1B Sump Suction Valve from opening.

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NARRATIVE

A. Plant Operating Conditions Before The Event:

Event Date: June 24, 2009 Event Time: 12:55

Unit: 1 MODE: 1 Reactor Power: 100 percent

Unit 1 Reactor Coolant System (RC) [AB]: Normal Operating Temperature and Pressure

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 June 24, 2009, Safety Injection system (SI) [BP] containment sump isolation valve 1SI8811B was stroked open for surveillance testing. The control board showed dual indication for the 1SI8811B valve but never indicated full open. An equipment operator stationed locally at 1SI8811B indicated that the valve went approximately 30-40 percent open and stopped. At 12:55 hours, the surveillance was suspended for the 1SI8811B being de-energized in the intermediate position. At the time of the event, Braidwood Unit 1 was in Technical Specification 3.5.2 and 3.6.6, Limiting Conditions for Operation, to support testing and maintenance of Train B of the Emergency Core Cooling System (ECCS) system. The B train of Residual Heat Removal (RH) system was drained to allow the 1SI8811B valve stroke performance without resulting in moving water from the refueling water storage tank (RWST) to the containment sump. When 1SI8811B failed to stroke fully open, Technical Specification 3.6.3, Containment Isolation Valves, Condition B was entered. Condition B requires the penetration flowpath be isolated within one hour by closing and deactivating one valve.

Investigation determined that the torque switch (TS) for the 1SI8811B motor operated valve (MOV) was corroded and non functional. The torque switch and limit switch finger bases were replaced, and diagnostic testing was performed. On June 26, 2009 at 02:42 hours, 1SI8811B was restored to operable status and LCOs were exited.

A review of past performance of the 1SI8811B valve indicated that the last time the valve was stroked successfully was September 20, 2007. The exact time of the failure cannot be determined, however it can be determined that the failure occurred between the times 1SI8811B was successfully stroked and when the failure was discovered. Therefore, this event is reportable per 10 CFR 50.73(a)(2)(i)(B), any condition prohibited by the plant's Technical Specifications. Additionally, since there was a period of time when the A RH Train was out of service for testing and maintenance coincident with the condition experienced by 1SI8811B, this event is reportable per 10 CFR 50.73(a)(2)(v)(B) as a condition that could have prevented the fulfillment of a system's safety function.

C. Cause of Event

Following the June 24, 2010 event, the 1SI8811B actuator limit switch compartment cover was removed for inspection of the TS assembly, limit switch (LS) assembly and wiring. The normally closed "open side" TS contacts were open, and the open TS bypass limit switch contact was also open. With both switch contacts open, the valve's motor would de-energize stopping valve travel. The TS was found to be corroded and non functional. The TS utilizes a spring to maintain the open and closed side contact in the closed position until a torque overload is experienced, opening the contacts. In this case, the "open side" TS contacts were open and had to be forcefully closed due to corrosion (i.e., the spring could not move the contact arm).

Water was found in the actuator LS compartment that houses the TS and LS components. The bottom of the compartment cover was wet and the unused and capped conduit penetrations on the bottom were full of water.

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Subsequent to this event, on 10/30/2009, water was identified dripping from the roof removable concrete slab area and falling in the area of the 1SI8811B valve. Further inspection identified water in the stem nut area of the valve forming a puddle on top of the actuator. It was noted, that during the several hours immediately prior to the walkdown, heavy rains had been experienced in the area. An inspection of the valve actuator identified the presence of water in the valve LS compartment. A conduit connection on the LS compartment was loose, which was the water intrusion point. Additionally, it was determined that the concrete removable slabs did not conform to the roof design drawings. Specifically, the design drawings indicate that a multi-ply insulated roof membrane was required to cover and seal the concrete removable slabs; however, none was ever installed.

The cause of the 1SI8811B failure to fully open was determined to be corrosion of the TS assembly, causing it to become non-functional, due to water intrusion into the LS compartment through the conduit connector. The root cause of this event was determined to be that station personnel did not fully understand that the area design configuration did not incorporate water tight electrical components to prevent water intrusion, resulting in a lack of sensitivity to the effects of water spills, sprays or leaks in the area.

D. **Safety Consequences:**

There were no safety consequences impacting the plant or public safety as a result of this event. The 1SI8811B valve is closed during normal operations, and the issue was discovered during a planned valve stroke test of the 1SI8811B valve in accordance with Operating surveillances as required by Technical Specifications.

An evaluation was performed to determine past operability and whether the valve could pass design flow at the as-found opening travel position for the valve. Based on the failure mode, the valve would have been capable of opening to the bypass LS setting of approximately 38 percent open, and the valve was capable of passing the required ECCS recirculation flow at this partial opening position. Additional consequences of the inability of 1SI8811B to achieve full open valve travel are the failure to meet the electrical interlock to manually open valve 1SI8804B, Residual Heat Removal (RH) to Safety Injection (SI) crosstie valve, and 1CS009B Containment Spray (CS) Pump 1B Sump Suction valve from the main control room. The 1SI8804B is required to open in order to establish flow from the ECCS sump to the Hi/Intermediate Head ECCS pumps during the cold leg recirculation phase of ECCS. The 1CS009B is required to open in order to establish flow to the CS system from the containment recirculation sump.

The SI containment sump is required for loss of coolant accidents (LOCA) inside containment during the recirculation phase of the accident. Additionally, rupture of a control rod drive mechanism causing a rod cluster control assembly ejection accident results in a loss of reactor coolant inventory which the SI system would be required to mitigate the accident. The SI containment sump isolation valves receive a signal to open when an SI signal is actuated and the refueling water storage tank (RWST) reaches the RWST Low-2 setpoint. The CS system is required for a LOCA to minimize containment pressure and will also actuate during a feedwater or steam line break inside containment.

This event resulted in a safety system functional failure due to loss of interlock function of 1SI8811B. The 1SI8811B is required to be fully open to make up electrical interlocks that allow opening of 1SI8804B and 1CS009B. The periods of time when the redundant train of RH and CS were unavailable result in a loss of safety function. The CS and ECCS systems would not be able to be realigned to take suction from the containment recirculation sump.

The risk evaluation concluded that the total risk impact associated with the failure of 1SI8811B to fully open was very low risk significance. However, as documented in the Final Significance Determination letter dated February 25, 2010, the NRC's assessment resulted in a finding with low to moderate safety significance.

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NARRATIVE

E. **Corrective Actions**:

Corrective actions taken include (actions completed):

- Replacement of the torque switch and limit switch finger bases
- Cleaning and drying the wires and limit switch compartment /enclosure on 1SI8811B
- Repairing the roof removable concrete slab area in accordance with design drawings

Corrective actions to prevent recurrence include:

- Provide training to all applicable Braidwood site personnel on the general design configurations and the need to ensure proper controls involving water within specific equipment qualification zones
- Develop and implement processes and controls to evaluate electrical components affected by potential water intrusion in safety related areas

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
Limitorque Corporation	Motor Operator Valve Actuator	SMB-2	N/A