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June 15, 2010
BW100060

10 CFR 50.73

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: Licensee Event Report 2009-003-01 – Drain Procedure for ECCS Suction Line Creates Unanalyzed Condition Due to Inadequate Configuration Requirements

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73, "Licensee event report system," paragraph (a)(2)(ii)(B), as an unanalyzed condition. This condition was identified on November 10, 2009, and involved inadequate controls in a safety system drain procedure that could have potentially created a leakage path outside of containment. This LER is a supplement to LER 2009-003-00 which was submitted on January 11, 2010. This supplement contains updated information regarding the safety significance 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. Ron Gaston, Regulatory Assurance Manager, at (815) 417-2800.

Respectfully,



Amir Shahkarami
Site Vice President
Braidwood Station

Enclosure: LER 2009-003-01

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.

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| 1. FACILITY NAME Braidwood Station, Unit 2 | 2. DOCKET NUMBER 05000457 | 3. PAGE 1 of 4 |
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4. TITLE
Drain Procedure for ECCS Suction Line Creates an Unanalyzed Condition Due to Inadequate Configuration Requirements

| 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 |
| 11 | 10 | 2009 | 2009 | 003 | 01 | 06 | 15 | 2010 | N/A | N/A |
| | | | | | | | | | FACILITY NAME | DOCKET NUMBER |
| | | | | | | | | | N/A | N/A |

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|--|--|---|--|---|--|--|--|--|--|--|
| 9. OPERATING MODE 1 | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) | | | | | | | | | |
| 10. POWER LEVEL 100% | <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) | | | | | | |
| | <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 checked="" 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 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 Ron Gaston, 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 | 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 |

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

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

On November 10, 2009, during an applicability investigation of a reportable event at another station, Braidwood Unit 2 identified two occurrences in which residual heat removal (RH) suction vent and drain valves were open while the containment sump isolation valve (SI8811) was capable of automatically opening during Operating Modes 1 through 4. These occurrences were Unit 2 RH Train B (2SI8811B) on December 7, 2006, and Unit 2 RH Train A (2SI8811A) on September 30, 2009. The events occurred during on-line planned work windows for the RH suction lines to replace the water as a dose reduction effort and to perform required valve stroke tests on the SI8811 valve for the respective train. The SI8811 valve receives an automatic open signal during a loss of coolant accident (LOCA) to switch the train-specific emergency core cooling system pumps' suction to the sump. Braidwood Operating Procedure (BwOP) RH-4, "Draining of the RH System," was initiated to drain the RH suction line. BwOP RH-4 requires the SI8811 valve to be closed, but it does not require it to be de-energized. Therefore, during the draining evolution, the SI8811 valve was still capable of opening in response to a LOCA. This would create a leak path of radioactive sump water outside of containment into the auxiliary building while the drain and vent valves were open. The cause was determined to be an inadequate drain procedure in that it did not require the SI8811 to be de-energized while the RH suction line was breached. Corrective actions include revising the procedure and performing an extent of condition assessment. This condition was subsequently determined to be an unanalyzed condition; however there were no actual safety consequences since at no time was an SI8811 valve open when the suction line was breached.

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NARRATIVE

Background:

The emergency core cooling system (ECCS) [BQ/BP] has two 100% redundant trains. Each train has three phases of operations: injection, cold leg recirculation, and hot leg recirculation. In the injection phase, borated water from the refueling water storage tank (RWST) is injected into the reactor coolant system (RCS) [AB] through the cold legs. When sufficient borated water has been removed from the RWST to maintain the reactor subcritical and the sumps can supply the required net positive suction head to the ECCS pumps, suction is switched to the sumps for cold leg recirculation. This is accomplished, in part, by an RWST low level signal automatically opening the sump isolation valve (i.e., SI8811) for each ECCS train. Though normally the SI8811 remains open during a design basis loss of coolant accident (LOCA), the valve is also considered an isolation valve in the event of a faulted line outside of containment during the accident should the line need to be isolated.

Technical Specification (TS) 3.5.2, "ECCS - Operating," is applicable in Modes 1 through 4 and allows for one train of ECCS to be inoperable for seven days. To facilitate maintenance or surveillance activities on the low head subsystem of the ECCS (i.e., residual heat removal (RH) [BP]), Braidwood Operating Procedure (BwOP) RH-4, "Draining the RH System" drains the appropriate section/s of piping, when needed. BwOP RH-4 does not restrict its use to any particular operating mode. However, historically, maintenance on the RH system which required draining was performed in a refueling outage. BwOP RH-4 requires the SI8811 valve in the train being drained to be closed, but it does not require it to be disabled from automatic opening.

In the 2006 timeframe, an on-line dose reduction initiative, to drain and replace the water in the RH suction line after the completion of an outage, was adopted. Also, since the American Society of Mechanical Engineers (ASME) In-Service Testing (IST) stroke testing of the SI8811 valves requires the RH suction line to be drained, Exelon Generating Company, LLC, via an approved IST relief request, moved the IST tests from Refueling Mode conditions to coincide with the drain of the RH piping for the on-line dose reduction initiative.

A. Plant Operating Conditions Before The Event:

Event Date: November 10, 2009 Event Time: 1500
 Unit: 2 MODE: 1 Reactor Power: 100 percent
 Unit 2 Reactor Coolant System: Normal operating temperature and pressure

B. Description of Event:

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

At Bryon Station on October 28, 2009 during a planned work window to drain one train of Unit 1 RH suction line, an on-shift licensed reactor operator (RO) questioned the adequacy of the BOP RH-4 (the Byron procedure equivalent to BwOP RH-4) controls. Specifically, the RO noticed the procedure positioned the SI8811 closed, but it remained energized. In this configuration, the valve would be capable of automatically opening if a LOCA were to occur. In the event of a LOCA during the draining evolution, and a subsequent switchover to cold leg recirculation occurred, a leak path would exist from the sump through the open drain and vent valves into the auxiliary building. Review of this issue at Byron concluded that having the RH vent and drain valves open while the SI8811 valve is capable of automatic opening is an unanalyzed condition.

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Braidwood Station conducted a review of this condition and on November 10, 2009, identified that Braidwood had previously performed the same evolution. The investigation revealed there were two occurrences in which the RH suction vent and drain valves were open while the SI8811 valve was capable of automatically opening during Operating Modes 1 through 4. These occurrences were: Unit 2 RH Train B, on December 7, 2006; and Unit 2 RH Train A, on September 30, 2009.

The exact duration of these previous conditions could not be determined, but is estimated to be similar to the Byron event (approximately 3.5 hours). Other RH work windows occurred that required draining of the RH suction line; however, due to the nature of the maintenance activities, the SI8811 valve was de-energized closed as part of the work control process.

This condition is being reported in accordance with 10 CFR 50.73(a)(2)(ii)(B) for being in an unanalyzed condition that significantly degraded plant safety.

C. Cause of Event

The cause of this condition was an inadequate procedure in that when executed in Operating Modes 1 through 4, the BwOP RH-4 did not provide necessary requirements to ensure a flow path from containment into the auxiliary building environment did not exist if an automatic SI8811 opening signal coincident with a LOCA occurred during the draining evolution. The lack of procedural controls in this procedure existed since original startup of the units. The cause of the inadequacy could not be determined.

Several contributing causes were also identified. These include:

- The work control process does not have an effective means to ensure rigorous technical human performance techniques are applied to the implementation of improvement initiatives.
- The Improved Technical Specifications and Bases implementation in February 1999 did not contain sufficient detail on this unique penetration configuration and its closed system outside of containment as a barrier.
- Licensed operators received less than adequate training on the importance of maintaining a closed system intact as an isolation barrier.

D. Safety Consequences:

There were no actual safety consequences to this condition. At no time, in Modes 1 through 4, was an SI8811 valve in an open condition with the RH suction line breached.

If a design basis accident (DBA) were to have occurred requiring the initiation of the ECCS during the short timeframe the RH vent and drain valves were open, then the SI8811 valve would have opened upon a RWST low level signal and radioactive sump water would have had a leakage path outside of containment and into the auxiliary building. Engineering evaluations of the potential safety consequences of this condition concluded the following:

1. There is reasonable assurance the postulated post LOCA radiological dose consequences from this potential containment bypass path would not have exceeded licensing basis offsite and main control room dose limits;
2. There is reasonable assurance no consequential post LOCA safety significant issues would result from this condition, such as removing ECCS inventory sufficient to impact the operability of the other ECCS train, impacting the functioning of the open SI8811 valve to close upon demand or other equipment due to the creation of an adverse environment; and
3. The risk impact of this condition is considered to be of very low safety significance.

This condition did not result in any safety system functional failures.

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E. Corrective Actions:

Procedure BwOP RH-4 has been revised to ensure the SI8811 valve is de-energized closed in Modes 1 through 4 while the RH vent and drain valves are open.

An extent of condition assessment was conducted for other containment penetrations with an isolation valve that receive an automatic open signal to mitigate a DBA. No further issues were identified. In addition, an extent of cause review was conducted to assess the adequacy of other activities moved from a refueling outage condition to an on-line condition.

Appropriate work control processes have been assessed to determine the adequacy of technical rigor being applied to improvement initiatives of this nature.

Training will be provided to licensed operators and engineers concerning lessons learned from this event. In addition, the licensed operator training program has been assessed to determine adequacy of training in terms of this penetration configuration and the application of TS requirements for procedure revisions that change the mode of performance of an activity.

The TS Bases has been enhanced regarding the configuration of the containment penetration containing the SI8811 valves.

F. Previous Occurrences:

Other than the occurrences mentioned in Section B, there have been no similar events identified at Braidwood Station in the previous three years.

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 |