



**Commonwealth Edison**  
Braidwood Nuclear Power Station  
Route #1, Box 84  
Braceville, Illinois 60407  
Telephone 815/458-2801

April 16, 1990  
BW/90-0410

U. S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Dear Sir:

The enclosed Licensee Event Report from Braidwood Generating Station is being transmitted to you as a voluntary LER.

This report is number 90-002-00; Docket No. 50-457.

Very truly yours,

R. E. Querio  
Station Manager  
Braidwood Nuclear Station

REQ/JDW/jfe  
(7126z)

Enclosure: Licensee Event Report No. 90-002-00

cc: NRC Region III Administrator  
NRC Resident Inspector  
INPO Record Center  
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## LICENSEE EVENT REPORT (LER)

Form Rev 2.0

|  |              |                      |                      |  |                 |                      |                 |                  |                     |   |  |  |                                |                                   |  |  |  |
|--|--------------|----------------------|----------------------|--|-----------------|----------------------|-----------------|------------------|---------------------|---|--|--|--------------------------------|-----------------------------------|--|--|--|
| Facility Name (1)<br><b>Braidwood 2</b>  |              |                      |                      |  |                 |                      |                 |                  |                     | Docket Number (2)<br><b>0   5   0   0   0   4   5   7</b>                                   |  |  |                                | Page (3)<br><b>1   of   0   6</b> |  |  |  |
| Title (4)<br><b>Transfer of Pressurizer Inventory to the Refueling Water Storage Tank Due to Procedural Deficiencies</b> |              |                      |                      |  |                 |                      |                 |                  |                     |   |  |  |                                |                                   |  |  |  |
| Event Date (5)   |              |                      | LER Number (6)       |  |                 |                      | Report Date (7) |                  |                     | Other Facilities Involved (8)   |  |  |                                |                                   |  |  |  |
| Month  | Day          | Year                 | Year                 | Sequential Number  | Revision Number | Month                | Day             | Year             | Facility Names      |   |  |  | Docket Number(s)               |                                   |  |  |  |
|  |              |                      |                      |  |                 |                      |                 |                  | NONE                |   |  |  | <b>0   5   0   0   0      </b> |                                   |  |  |  |
| <b>0   3</b>   | <b>1   8</b> | <b>9   0</b>         | <b>9   0</b>         | <b>0   0   2</b>   | <b>0   0</b>    | <b>0   4</b>         | <b>1   7</b>    | <b>9   0</b>     |                     |   |  |  | <b>0   5   0   0   0      </b> |                                   |  |  |  |
| OPERATING MODE (9)   |              | <b>5</b>             |                      | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11) |                 |                      |                 |                  |                     |   |  |  |                                |                                   |  |  |  |
| POWER LEVEL (10)<br><b>0   0   0</b>   |              | 20.402(b)            |                      | 20.405(c)  |                 | 50.73(a)(2)(iv)      |                 | 73.71(b)         |                     |   |  |  |                                |                                   |  |  |  |
|  |              | 20.405(a)(1)(i)      |                      | 50.36(c)(1)  |                 | 50.73(a)(2)(v)       |                 | 73.71(c)         |                     |   |  |  |                                |                                   |  |  |  |
|  |              | 20.405(a)(1)(ii)     |                      | 50.36(c)(2)  |                 | 50.73(a)(2)(vii)     |                 | X Other (Specify |                     |   |  |  |                                |                                   |  |  |  |
|  |              | 20.405(a)(1)(iii)    |                      | 50.73(a)(2)(i)   |                 | 50.73(a)(2)(viii)(A) |                 | in Abstract      |                     |   |  |  |                                |                                   |  |  |  |
|  |              | 20.405(a)(1)(iv)     |                      | 50.73(a)(2)(ii)  |                 | 50.73(a)(2)(viii)(B) |                 | below and in     |                     |   |  |  |                                |                                   |  |  |  |
| 20.405(a)(1)(v)  |              | 50.73(a)(2)(iii)     |                      | 50.73(a)(2)(x)   |                 | Text)                |                 |                  |                     |   |  |  |                                |                                   |  |  |  |
| LICENSEE CONTACT FOR THIS LER (12)   |              |                      |                      |  |                 |                      |                 |                  |                     |   |  |  |                                |                                   |  |  |  |
| Name<br><b>Jerald D. Wagner, Regulatory Assurance</b>  |              |                      |                      |  |                 |                      |                 |                  |                     | TELEPHONE NUMBER<br>AREA CODE<br><b>8   1   5</b> <b>4   5   8</b> <b>-   2   8   0   1</b> |  |  |                                |                                   |  |  |  |
| Ext. 2497  |              |                      |                      |  |                 |                      |                 |                  |                     |   |  |  |                                |                                   |  |  |  |
| COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)   |              |                      |                      |  |                 |                      |                 |                  |                     |   |  |  |                                |                                   |  |  |  |
| CAUSE  | SYSTEM       | COMPONENT            | MANUFAC-TURER        | REPORTABLE TO NPRDS  | CAUSE           | SYSTEM               | COMPONENT       | MANUFAC-TURER    | REPORTABLE TO NPRDS |   |  |  |                                |                                   |  |  |  |
| <b>X</b>   | <b>A   B</b> | <b>S   E   A   L</b> | <b>W   1   2   0</b> | <b>YES</b>   |                 |                      |                 |                  |                     |   |  |  |                                |                                   |  |  |  |
| SUPPLEMENTAL REPORT EXPECTED (14)  |              |                      |                      |  |                 |                      |                 |                  |                     | Expected Submission Date (15)   |  |  |                                |                                   |  |  |  |
| Yes (If yes, complete EXPECTED SUBMISSION DATE)  |              |                      |                      |  |                 |                      |                 |                  |                     | <b>X   NO</b>   |  |  |                                |                                   |  |  |  |
| ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)                         |              |                      |                      |  |                 |                      |                 |                  |                     |   |  |  |                                |                                   |  |  |  |

At 0831 on March 18, 1990 a Nuclear Station Operator (NSO) placed the 2A Residual Heat Removal (RH) pump on recirc for boron sample. An operator opened the isolation valve from the RH pump discharge to the Refueling Water Storage Tank (RWST). At 1020 the NSO shutdown the pump. The NSO decided to realign the pump suction for Shutdown Cooling. At 1022 the RCS suction isolation was opened which created a flow path from the RCS at 350 psig to the RWST at atmospheric pressure. Pressurizer level and RCS pressure rapidly decreased. At 1023 the Pressurizer Low Level alarm alerted the NSO to the condition. The NSO then realized that the flowpath had been created. Charging flow was increased to the maximum and the charging pump suction was realigned to the RWST. At 1023 an NSO tripped the 2C and 2D RCPs, closed the RCS suction valve, aligned the suction of the 2A RH pump to the RWST and started the pump to re-flood the RCS. The pump discharge flowpath to the RWST was isolated by closing a cross-tie valve. By 1030 Pressurizer level indicated 34% and RH flow was reduced. The 2B RH pump remained in operation throughout the event and was unaffected. The cause of this event was procedural deficiencies. Contributing causes were personnel error and programmatic deficiency. Corrective actions include procedure revisions, implementation of awareness programs, training, and valve position placard for the main control board. No previous occurrences. This is a voluntary LER.



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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|                   |                               |                |     |                      |     |                    |       |          |       |  |
| Braidwood 2       | 0   5   0   0   0   4   5   7 | 9   0          | -   | 0   0   2            | -   | 0   0              | 0   2 | OF       | 0   6 |  |

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: Braidwood 2; Event Date: March 18, 1990; Event Time: 1022;  
 Mode: 5 - Cold Shutdown; Rx Power: 0%;  
 RCS [AB] Temperature/Pressure: 135 degrees F/350 psig

B. DESCRIPTION OF EVENT:

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

The B Train of Residual Heat Removal (RH) [BP] was in operation in the shutdown cooling mode. Preparations were in progress to place the A RH train in operation to facilitate testing of the B RH train. These preparations included placing the A RH pump in operation on recirc to obtain a boron sample. Reactor Coolant Pumps (RCP) C and D were in operation, A and B RCPs were shutdown. Pressurizer level indicated 62% on the level instruments calibrated for Power Operation conditions. This corresponded to an actual level of approximately 44% for existing Pressurizer conditions.

At 0831 on March 18, 1990 a Nuclear Station Operator (NSO) (Licensed Reactor Operator) and an NSO trainee placed the 2A RH pump on recirculation in accordance with BwOP RH-5, RH System Startup for Recirculation, to obtain a boron concentration sample. The control room manipulations for this activity were performed by a trainee enrolled in the Initial Licensing OJT program. All actions performed by the trainee were under the direct supervision and with prior concurrence of the Unit 2 NSO. The Unit 2 NSO directed an Equipment Attendant (EA) (Non-Licensed Operator) to open the 2RH8735, RH System Discharge to the Refueling Water Storage Tank (RWST) [BQ/BR] Isolation Valve, in accordance with BwOP RH-5. The 2RH8735 is the isolation valve for the eight inch line from the RH pump discharge cross-tie header to the RWST.

While the 2A RH pump was operating in recirculation the Unit 2 NSO briefly discussed the status of the 2RH8735 with the Station Control Room Engineer (SCRE) (Senior Reactor Operator Licensed Supervisor) (SRO). The discussion focused on the position for the valve when the 2A RH pump was shutdown after the sample was taken. The SCRE instructed the NSO to leave the 2RH8735 in the open position. This would save 2 entries into a radiologically controlled area in the event additional recirculation was needed. The SCRE's intention was to stop in the procedure at this step and wait for the results of the boron sample.

The NSO's perception of this instruction was to complete procedure BwOP RH-5 but to leave the 2RH8735 in the open position. A note preceeding the step to close the 2RH8735 provided latitude for the valve to be positioned different than the procedure in Modes 5 or 6 at the SRO's discretion.

At 1020 the NSO trainee shutdown the 2A RH pump.

The trainee and the NSO completed the remaining steps of BwOP RH-5. The status of the 2A RH train at the completion of the procedure was lined up for injection, its Mode 1-3 alignment position. The NSO and the trainee briefly discussed this status and decided to realign the pump suction for Shutdown Cooling to provide for Cold Overpressure Protection via its suction relief valve. This was a normal alignment for Mode 5.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

B. DESCRIPTION OF EVENT: (cont'd)

At 1022 the trainee closed the 2SIB812A, 2A RH Pump RWST Suction Isolation Valve. When the valve indicated full closed the trainee opened the 2RH8701A, 2A RH pump RCS suction isolation. Opening this valve with the 2RH8735 open provided a flow path from the RCS which was at 350 psig to the RWST which was at atmospheric pressure. Pressurizer level and RCS pressure rapidly decreased.

At 1023 the Pressurizer Low Level alarm annunciated. The Unit 2 NSO acknowledged the alarm and observed the rapid decrease in Pressurizer Level. The Unit 2 NSO informed another NSO, who had been involved with unrelated activities on the Unit 2 Computer, of the rapid level decrease. The "Extra" NSO inquired as to what had been the last activity the Unit 2 NSO performed. With this prompt, the Unit 2 NSO realized that a flowpath from the RCS to the RWST had been established by opening the 2RH8701A with the 2RH8735 open. The Unit 2 NSO attempted to close the 2RH8701A but could not because the valve, which takes approximately 1.5 minutes to open, was still going open.

The extra NSO observed that the flows for the C and D RCP's were decreasing as pressurizer level was nearing zero. To aid in restoring Pressurizer inventory, the extra NSO manually increased charging (CB) flow to the maximum through the normal charging header and realigned the charging pump suction to the RWST by opening valves 1CV112D and 1CV112E, RWST to Charging Pump Suction Isolation Valves. While performing these actions the extra NSO observed that the RCP #1 seal differential pressures had decreased below the minimum permissible value of 200 psid.

At 1023 the extra NSO tripped the 2C and 2D RCPs. The 2RH8701A reached the full open position. The Unit 2 NSO, who had been waiting for the valve to reach the full open position, immediately took the control switch to the closed position and the valve began to close.

By 1024 Pressurizer Level indicated 0% and RCS pressure had declined to its minimum value of approximately 35 psig. The recovery portion of the event began at this time.

At 1025 the 2RH8701A reached the full closed position. The Center Desk NSO, who had entered the Unit 2 Control Panel area after observing the alarms and the increased activities, recommended that the 2A RH pump suction be realigned to the RWST to reflood the Pressurizer using the 2A RH pump. This recommendation was immediately approved by a Shift Foreman (SRO Licensed Supervisor) who had recently entered the Unit 2 Control area. The Unit 2 NSO opened the 2SIB812A and started the 2A RH pump to re-flood the RCS from the RWST. Realizing that the 2RH8735 was still open, the Unit 2 NSO closed the 2RH8716A, RH pump discharge header cross-tie valve, to isolate the flowpath.

At 1028 Pressurizer Level indication began increasing from its previous value of zero.

By 1030 Pressurizer Level indicated 34% and RH flow was reduced. During the re-flood operation the cooldown of the Pressurizer Surge Line and Water Space temperatures indicated a cooldown of approximately 280 and 240 degrees F respectively in an eight minute period. This was in excess of the 200 degrees F in a one hour period permitted by the Technical Specifications. The appropriate Action Statement was entered and complied with.

A review of the data after the event indicated that the volume of RCS/RH transferred to the RWST was equal to 2.25% of RWST Level, approximately 9,800 gallons. Of this approximately 5,500 gallons are accounted for by the volume of the Pressurizer and Surge Line. The remaining 3,300 gallons has been attributed to voiding in the suction lines of the 2C and 2D RCPs due to a loss of net positive suction head from the RCS pressure reduction with the pumps in operation. This is believed to be a localized effect. Reactor Vessel Level indicated 100% throughout the event. The maximum flow rate through the idle 2A RH pump was in excess of 5000 gpm. This flowrate lasted less than 2 minutes. The 2B RH pump remained in operation in the Shutdown Cooling mode of operation throughout the event and was relatively unaffected by the event.



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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

**B. DESCRIPTION OF EVENT:**

This event was classified as a Potentially Significant Event.

A Special Inspection by an NRC Regional Inspector was conducted for this event.

After discussion with the NRC Resident Inspectors it was determined that the distribution mechanisms provided by the Licensee Event Report program would be appropriate to provide for both NRC and industry analysis of this event. This event is being reported as a voluntary LER.

Based on the initial information associated with this event a "Braidwood Station Error Evaluation Presentation" was held to review this event with the personnel directly involved and their supervisor. The corrective actions addressing both root and contributing causes are detailed below.

**C. CAUSE OF EVENT:**

The root cause of this event was procedural deficiencies. BwOP RH-5 provided for completion of the procedure with the 2RH8735 in the open position. This alignment provided for a flowpath from the RH system to the RWST. BwOP RH-6, Placing the RH System in Shutdown Cooling, provided for entry into the procedure with the 2RH8735 in the open position and then directed performance of operations that aligned the suction of the RH pump to the RCS. Performing the actions specified in procedures BwOP RH-5 and BwOP RH-6 with the 2RH8735 in the open position as provided for within the bounds of both procedures created the event.

Contributing Causes to the Event Were:

1. The NSO failed to maintain awareness of an RH valve alignment that he had directed. As a result the impact of this valve alignment on the RH system was not considered prior to performing additional actions to realign the 2A RH pump for shutdown cooling. This is considered a personnel error.
2. The NSO completed a procedure, transitioned to another non-routine procedure, and had a significant abnormal operating situation occur on the Unit without informing the SCRE. The SCRE had specific intentions on stopping in BwOP RH-5 but failed to adequately communicate these intentions to the Unit 2 NSO. Maintaining an environment where communication before, during, and after the performance of activities is the expected norm; is the responsibility of each individual at Braidwood Station. A failure of individuals to perform this responsibility, as was the case in this event, is considered a Programmatic deficiency.

**D. SAFETY ANALYSIS:**

This event had no effect on the safety of the plant or public. Considering the static head of the RWST and RCS temperature of 135°F, the formation of a steam void in the reactor vessel was improbable. The operator actions provided for a rapid refill of the Pressurizer. However, after the initial depressurization of the RCS, which happened within the first 2 minutes of the event, the RCS pressure would have stabilized at the static head of the RWST. Back flow from the RWST to the RCS would have occurred with the existing plant alignment until an equilibrium value of Pressurizer Level and Pressure was achieved. This would have occurred without operator action.

The 2B RH pump, which was in operation throughout the event, was providing the necessary decay heat removal. The 2B RH pump was fully capable of extended operation with the RCS conditions that did exist or could have existed with this plant alignment.

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TEXT Energy Industry Identification System (EIIIS) codes are identified in the text as [XX]

D. SAFETY ANALYSIS: (cont'd)

Under the worst case condition of this event occurring during initial entry into Mode 4 after extended unit operation there would still be no effect as this is enveloped in section 5.4 of the Updated Final Safety Analysis Report. The design of the RH system provides for complete isolation of an RH Loop using redundant isolation valves. Physical train separation would provide the capability to provide for extended decay heat removal from the opposite RH train, or decay heat could be removed via the Steam Generators being supplied by the Auxiliary Feedwater system.

E. CORRECTIVE ACTIONS:

The 2A RH pump suction was isolated from the RCS. A refill of the Pressurizer from the RWST using the 2A RH pump was performed. The return flow path to the RWST was isolated and stable plant conditions were established.

Vibration readings were taken on the 2A RH pump. The readings were consistent with the data taken on previous pump surveillances. Based on the evaluation of this data it has been concluded that the event had no significant effect on the 2A RH pump.

An investigation has been initiated to determine the extent of the damage to the 2C and 2D RCPs. These seal packages were scheduled to be replaced during the outage. The 2C RCP seal package has been disassembled and inspected. The inspection revealed that the #1 seal had experienced a "rubbing" of the faceplates. The vendor representative performing the inspection stated that #1 seal replacement would have been prudent with the amount of rubbing observed had the seal replacement not been planned. The 2D RCP seal package is scheduled for removal and inspection later in the outage which is currently in progress. This investigation will be tracked to completion by action item 457-200-90-00603.

Operations Department has implemented the "Heightened Level of Awareness" (HLA) program. The purpose of the program is to ensure that increased levels of discussion occur prior to the performance of non-routine or infrequent activities.

An Engineering Evaluation has been performed to determine the effects of the cooldown on the Pressurizer. Based on the results of this evaluation it has been concluded that the effects were insignificant and that continued operation is acceptable.

Based on the initial information associated with this event the personnel directly involved with this event participated in a "Braidwood Station Error Evaluation Presentation" to identify the root and contributing causes of this event. Based on the conclusions of this presentation the following corrective actions will be taken.

Procedure BwOP RH-5 will be revised to require the 2RH8735 or its Unit 1 counterpart 1RH8735 to be locked in the closed position prior to the completion of the procedure. This has been accomplished by a temporary procedure. The change will be made permanent. This action will be tracked to completion by action item 457-200-90-00601.

Procedure BwOP RH-6 will be revised to require the 2RH8735 or its Unit 1 counterpart 1RH8735 to be locked in the closed position as a prerequisite to performance of the procedure. This has been accomplished by a temporary procedure. The change will be made permanent. This action will be tracked to completion by action item 457-200-90-00602.



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E. CORRECTIVE ACTIONS: (cont'd)

An HLA committee has been formed. This committee consists of representatives from the various station work groups as well as management. The mission of this committee is to promote policies and programs designed to create a working environment which contains the highest achievable standards of communication, teamwork, and self-checking practices.

Placards have been developed for the main control boards to identify the status of the 1/2RH8735.

A training tailgate session will be held on this event for appropriate Operating personnel. This action will be tracked to completion by action item 457-200-90-00204.

F. PREVIOUS OCCURRENCES:

There have been no previous similar occurrences.

There was an occurrence of a loss of pressurizer inventory event.

LER 50-456/89-016

DVR 20-1-89-193

Residual Heat Removal Pump Suction Relief Valve Premature Actuation and Failure to Reseat Due to Deficient Work Practices and Personnel Error.

The corrective actions were implemented addressing both root and contributing causes. Previous corrective actions are not applicable to this event.

G. COMPONENT FAILURE DATA:

| Manufacturer | Nomenclature              | MFG Part Number  |
|--------------|---------------------------|------------------|
| Westinghouse | RCP Seal #1 Runner        | 5061D29G01 rev 3 |
| Westinghouse | RCP Seal #1 Ring Assembly | 5061D28G01 rev 7 |