



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

March 3, 1993  
BW/93-0092

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 with the requirement of 10CFR50.73(a)(2)(v) which requires a 30-day written report.

This report is number 93-002, Docket No. 50-456.

K. L. Kofron  
Station Manager  
Braidwood Nuclear Station

KLK/AJS/dla  
ZCREG/21

Encl: Licensee Event Report No. 50-456/93-002

cc: NRC Region III Administrator  
NRC Resident Inspector  
INPO Record Center  
CECo Distribution List

050031

9303090085 930303  
PDR ADOCK 05000456  
S PDR

*Test 1/1*

## LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MABB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  
Braidwood 1DOCKET NUMBER (2)  
05000456PAGE (3)  
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## TITLE (4)

Nonconservatism in Heatup/Cooldown and Cold Overpressure Protection PORV Setpoint Curves

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 NAME	DOCKET NUMBER
02	01	93	93	-- 002 --	00	03	03	93	Braidwood 2	05000457
									FACILITY NAME	DOCKET NUMBER
										05000
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)	
POWER LEVEL (10)		099	20.405(a)(1)(i)		50.36(c)(1)		<input checked="" type="checkbox"/> 50.73(a)(2)(v)		73.71(c)	
			20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER	
			20.405(a)(1)(iii)		50.73(b)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)	
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)			
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)			

## LICENSEE CONTACT FOR THIS LER (12)

NAME  
D. Lawrence, Technical Staff EngineerTELEPHONE NUMBER (Include Area Code)  
(815) 458-2801 x2683

## COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRCDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRCDS
				No					

## SUPPLEMENTAL REPORT EXPECTED (14)

YES	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
<input checked="" type="checkbox"/>	<input type="checkbox"/>				

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

A nonconservative calculation used in the generation of the Heatup Curves, Cooldown Curves, and the Low Temperature Overpressure Protection / Cold Overpressure Mitigation System (LTOP/COMS) Nominal Power Operated Relief Valve (PORV) Pressure Relief Setpoint Curves was identified. The purpose of these curves is to protect the reactor vessel against exceeding 10CFR50 Appendix G limits. This issue was identified after a review of two INPO Nuclear Network informational entry items from Comanche Peak Station. The nonconservatism relates to the pressure difference that exists between the wide-range pressure transmitters and the pressure corresponding to the reactor vessel beltline when one or more of the reactor coolant pumps (RCPs) are running. All components/devices were determined to be operable, with compensatory actions required under certain conditions. The cause of the event has been determined to be a design deficiency in the original Westinghouse analysis used to determine the LTOP/COMS setpoints.

The immediate corrective action was to provide guidance to shutdown three RCPs prior to initiating an RCS cooldown following a reactor shutdown / trip. The appropriate curve book figures and surveillance procedures were revised to account for the 50 psig nonconservatism when four RCPs are running. No other previous events similar to this were identified.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**A. PLANT CONDITIONS PRIOR TO EVENT:**

Unit: Braidwood 1; Event Date: February 1, 1993;  
Event Time: 1456  
Mode: 1 - Power Operation; Rx Power: 099%;  
RCS [AB] Temperature/Pressure: NOT / NOP;

Unit: Braidwood 2; Event Date: February 1, 1993;  
Event Time: 1456  
Mode: 1 - Power Operation; Rx Power: 099%;  
RCS [AB] Temperature/Pressure: NOT / NOP;

**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.

This event involves a nonconservative calculation used in the generation of the Heatup Curves, Cooldown Curves, and the Low Temperature Overpressure Protection / Cold Overpressure Mitigation System (LTOP/COMS) Nominal Power Operated Relief Valve (PORV) Pressure Relief Setpoint Curves for Braidwood Station. The purpose of these curves is to protect the reactor vessel against exceeding Appendix G limits.

The calculation nonconservatism relates to the pressure difference that exists between the wide-range pressure transmitters (PT-403, 405, 406 and 407) and the pressure corresponding to the reactor vessel beltline when one or more of the reactor coolant pumps (RCPs) are running.

Personnel from Braidwood, Byron, Zion, and the Nuclear Engineering Dept. evaluated INPO Nuclear Network Operating Experience entry number OE 5691 (dated 11/24/92) and a Nuclear Network plant status item (dated 12/02/92). Both of these items related to nonconservatisims identified at other Westinghouse PWR plants. It was determined that this issue was potentially applicable to Braidwood, Byron and Zion Stations. This was based upon input from personnel at Westinghouse who performed the calculation.

Correspondence from Westinghouse indicated the following regarding their mistake in performing the calculations:

1. Setpoint methodology utilized for Braidwood did not account for the pressure difference between the wide range pressure transmitters and the pressure corresponding to the vessel beltline with RCPs running. Furthermore, this issue is generic for all Westinghouse plants where Westinghouse performed the calculations.

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2. The pressure difference is dependent upon the number of RCPs operating. The pressure difference between the wide-range pressure transmitters and the core mid-plane elevation may be as little as 7 psig with one RCP operating and as much as 50 psig when four RCPs are operating.

The evaluation determined that this nonconservatism poses two concerns. The first was the operability of the reactor vessel based on past operation within the Heatup/Cooldown Curves that were in the Technical Specifications, and second was the operability of the LTOP/COMS during water solid conditions at temperatures less than 120 degrees F. Neither unit was operating in a mode that required the LTOP/COMS to be operable at the time this concern was identified.

The affected components/devices are the reactor vessel and the LTOP/COMS PORVs. All components/devices were determined to be operable with compensatory actions required under certain conditions.

The following compensatory or mitigating conditions were implemented to ensure operability of Braidwood Units 1 & 2 with respect to (1) the heatup and cooldown curves for all modes and (2) water solid conditions when RCS temperature is less than 120 degrees Fahrenheit for modes 5 & 6. The conditions are:

1. Maintain administrative controls to operate 50 psig below heatup/cooldown curves when any one or more RCPs are running.
2. During water solid operation of Unit 1 at RCS temperatures below 120 degrees F, assure actual PORV setpoints are at least 7 psig below the nominal/maximum PORV setpoint value defined in the Technical Specification. No action is required with respect to the PORV setpoints with no RCPs running to assure the Appendix G limits are not exceeded.
3. During water solid operation of Unit 2 at RCS temperature below 120 degrees F, maintain administrative controls to operate no more than one RCP during water solid operations at RCS temperatures below 120 degrees F.

Furthermore, Westinghouse has indicated that past operation of the reactor vessel with an overshoot of the Appendix G limits of up to 100 psig will have no adverse effects on the integrity of the reactor vessel. These findings are documented in ENC-QE-40.1 "Operability Determination Checklist" (dated February 1, 1993).

On February 1, 1993 at 1456 hours it was determined that past operation within the Technical Specification Heatup/Cooldown Curves could have exceeded the Appendix G limits due to the nonconservatism. Additionally, under certain conditions, the LTOP/COMS PORVs would not have satisfactorily

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mitigated the mass input and heat input transients since the Appendix G limits would have been exceeded.

An Emergency Notification System phone call was made and the NRC Resident Inspector was notified at 1658 hours pursuant to 10CFR50.72(b)(2)(iii)(D).

This event is reportable pursuant to 10CFR50.73(a)(2)(v)(D) - any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

#### C. CAUSE OF EVENT:

The cause of the event has been determined to be a design deficiency. The Westinghouse analysis used to determine the LTOP/COMS setpoints and licensing basis did not account for the differential pressure between the reactor vessel cold legs and the pressure transmitter instrument taps on the RCS hot leg piping with RCPs running.

#### D. SAFETY ANALYSIS:

Braidwood Station Operability Evaluation (BWAP 330-10A2) dated February 2, 1993 and Nuclear Engineering Dept. Operability Determination (ENC-QE-40.1) dated February 1, 1993 document the operability of LTOP/COMS and the continued use of Technical Specification Heatup/Cooldown Curves with the compensatory actions. In addition, past operations were determined to have had no adverse effects upon reactor vessel integrity. This determination is based upon a Westinghouse statement that overshoot of the Appendix G limits of up to 100 psig would have no adverse effects.

In Modes 4, 5, and 6 with the reactor vessel head on, the LTOP/COMS requires the operability of either two PORVs or two residual heat removal (RHR) suction relief valves, or one PORV and one RHR suction relief valve. This requirement ensures that the RCS is protected from pressure transients that could exceed the limits of 10CFR50 Appendix G, when one or more of the RCS cold leg(s) are less than or equal to 350 degrees F. Transient analysis was performed by Westinghouse and described in UFSAR 5.2.2.11 to determine the maximum pressure for the postulated worst case mass input and heat input events. These events include: 1) the starting of a centrifugal charging pump and its injection when the plant is solid and 2) the start of an idle RCP with the secondary water temperature of the steam generator less than or equal to 50 degrees F above RCS cold leg temperatures. Analyses have shown that one PORV is sufficient to prevent exceeding these limits due to anticipated mass and heat input transients.



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With RCS temperature below 200 degrees F, (i.e. cold shutdown) one RHR loop is required to be operable and in operation and the other RHR loop is required operable. This requirement ensures that at least one RHR suction relief valve is also available for overpressure protection of the RCS. The ENC-QE-40.1 does not take credit for the RHR suction relief and is conservative in this respect.

Section 5.2 of the UFSAR states that the Appendix G curves are excessively conservative for their intended purpose of assuring vessel integrity during cold conditions.

**E. CORRECTIVE ACTIONS:**

The immediate corrective action was to provide guidance to shutdown three RCPs prior to initiating an RCS cooldown following a reactor shutdown / trip. This guidance was provided as exceptions to the BwGP 100-5T1, Plant Shutdown and Cooldown Flowchart.

The Curve Book figures, BwCB Fig. 27 - RCS Heatup Limitations and BwCB Fig. 28 - RCS Cooldown Limitations were revised to account for the 50 psig nonconservatism when four RCPs are running.

The Reactor Coolant System Pressure/Temperature Limit Surveillance procedures (1(2) BwOS 4.9.1.1-1) for both Units were revised to refer to the curvebook figures described above that account for the 50 psig nonconservatism.

BwGP 100-1, Plant Heatup, will be revised to require that not more than one RCP be started prior to increasing RCS temperature to greater than 120 degrees F. This will be tracked to completion by action item 456-180-93-00201.

BwOP RC-1, Startup of a Reactor Coolant Pump, will be revised to require that not more than one RCP be started prior to increasing RCS temperature to greater than 120 degrees F. This will be tracked to completion by action item 456-180-93-00202.

BwGP 100-5, Plant Shutdown and Cooldown, will be revised to require that no more than one RCP be in operation prior to reducing RCS temperature to less than 120 degrees F. This will be tracked to completion by action item 456-180-93-00203.

A follow up will be conducted with Westinghouse to determine long term resolution. This will be tracked to completion by action item 456-180-93-00204.

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F. PREVIOUS OCCURRENCES:

This issue was first identified at Comanche Peak (OE 5691). This issue is applicable to PWRs for which Westinghouse prepared the LTOP/COMS setpoints. No other previous Licensee Event Reports similar to this were identified.

G. COMPONENT FAILURE DATA:

This event was neither the result of a component failure nor did any components fail as a result of this event.