

NRC 2003-0047

10 CFR 50.73

May 23, 2003


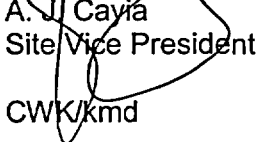
U. S. Nuclear Regulatory Commission  
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POINT BEACH NUCLEAR PLANT UNIT 2  
DOCKET NO. 50-301  
LICENSEE EVENT REPORT 301/2003-002-00  
REACTOR SHUTDOWN REQUIRED DUE TO TECHNICAL SPECIFICATION  
TSAC 3.1.6.B.2 NOT MET

Enclosed is Licensee Event Report (LER) 301/2003-002-00 for the Point Beach Nuclear Plant Unit 2. This LER discusses a manual reactor shutdown as a result of control rod bank sequence count exceeding the Core Operating Limits Report limit of 125 steps by one step. This event is reportable in accordance 10 CFR 50.73(a)(2)(i)(A) for, "The completion of any nuclear plant shutdown required by the plant's Technical Specifications."

Corrective actions, completed and proposed, have been identified in the enclosed report. There are no new commitments in this report.

If you have any questions concerning the information provided in this report, please contact Mr. C. W. Krause at (920) 755-6809.

  
A. J. Cayia  
Site Vice President  
  
CWK/kmd

Enclosure

cc: NRC Regional Administrator  
NRC Project Manager

NRC Resident Inspector  
PSCW

JE22

## LICENSEE EVENT REPORT (LER)

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

Estimated burden per response to comply with this mandatory information collection request: 50 hours. 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 [bjst1@nrc.gov](mailto:bjst1@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-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.

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TITLE (4)  
REACTOR SHUTDOWN REQUIRED DUE TO TECHNICAL SPECIFICATION TSAC 3.1.6.B.2 NOT MET

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
04	05	2003	2003	- 002	- 00	05	23	2003		05000
OPERATING MODE (9)		2	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR *: (Check all that apply) (11)							
POWER LEVEL (10)		< 5%	20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
			20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)	50.73(a)(2)(x)
			20.2203(a)(1)			50.36(c)(1)(i)(A)			50.73(a)(2)(iv)(A)	73.71(a)(4)
			20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)	73.71(a)(5)
			20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)	OTHER
			20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		X	50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)	
			20.2203(a)(2)(v)			50.73(a)(2)(i)(B)			50.73(a)(2)(vii)	
			20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(viii)(A)	
			20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(viii)(B)	

## LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Charles Wm. Krause, Senior Regulatory Compliance Engineer	(920) 755-6809

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

## SUPPLEMENTAL REPORT EXPECTED (14)

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

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

At 2050 CST on April 5, 2003, indications were noted at the Point Beach Nuclear Plant Unit 2 that the sequence difference between the position of control bank "C" and control bank "D" was at 126 steps. Technical Specification LCO 3.1.6, "Control Bank Insertion Limits," states that the control banks shall be within the insertion, sequence, and overlap limits specified in the Core Operating Limits Report (COLR). Figure 3 of the Unit 2 COLR specifies the sequence limit is 125 steps. At that time Control Bank "C" was at 194 steps and Bank "D" was at 68 steps. In accordance with the Technical Specifications, TSAC 3.1.6.B.1.1 was entered to verify the shutdown margin (SDM) within one hour and TSAC 3.1.6.B.2 was entered to restore control bank sequence and overlap to within limits within two hours.

The SDM was verified at 2124 CST and TSAC 3.1.6.B.1.1 was met. At 2250 CST the required action for TSAC 3.1.6.B.2 was determined to have not been met within the allowed completion time. As a result, TSAC 3.1.6.C was entered. This action statement requires the reactor to be in Mode 2 with keff < 1.0, with a completion time of six hours. At 0530 CDT on April 6, 2003, Unit 2 entered Mode 3 and the LCO 3.1.6.C.1 was considered met. Equipment performed as expected during this reactor shutdown. A reactor startup was subsequently initiated on April 8, 2003. The rod drive system performed as expected during this start up and return to full power.

The NRC was notified of this event in accordance with 10 CFR 50.72 (b)(2)(i) at 0942 CDT on April 6, 2003.

**LICENSEE EVENT REPORT (LER)**  
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Point Beach Nuclear Plant, Unit 2	05000301	2003	- 002	- 00	2 OF 4

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

**Event Description:**

At 1045 on April 5, 2003, the operators of the Point Beach Nuclear Plant (PBNP) Unit 2 commenced a planned power reduction to approximately 52% to enable the removal of a single feed water [SJ] train for the purpose of performing main feed water pump [P] lube oil cleaning. The down power ramp was completed at 1531 with reactor power at approximately 53%. At 1651, the operators entered AOP-2B, "Feedwater System Malfunction" due to problems with the condensate and feedwater systems. As directed by AOP 2B, procedure AOP-17A, "Rapid Power Reduction," was entered at 1653 to recover feed pump suction pressure. At 1654 the operators noticed a lowering of the PBNP Unit 2 condenser [SG] vacuum. At 1708 a low vacuum alarm was received and Abnormal Operating Procedure (AOP) 5A "Loss of Condenser Vacuum," was entered. At 1717 with vacuum continuing to lower the shift manager ordered a manual trip of the Unit 2 turbine [TA]. At 1718 the Unit 2 generator [TB] output breaker [BKR] was tripped and at 1719 Unit 2 entered Mode 2 with the reactor critical ( $k_{eff} = 1$ ). Subsequently, the main steam [SB] isolation valves [V] were shut and reactor coolant system [AB] temperature control was transferred to the atmospheric steam dumps.

At 2050 indications were noted in the control room that the difference between Unit 2 control rod [AA] bank "C" and control bank "D" was at 126 steps. The control bank sequence difference for Unit 2 was required to be 125 steps. Technical Specification LCO 3.1.6, "Control Bank Insertion Limits," states that the control banks shall be within the insertion, sequence difference, and overlap limits specified in the Core Operating Limits Report (COLR). Figure 3 of the Unit 2 COLR specifies the sequence limit as 125 steps. At the time of this discovery, Control Bank "C" was at 194 steps and Bank "D" was at 68 steps, a difference of 126 steps.

The modes of applicability for LCO 3.1.6 are Mode 1 and Mode 2 with  $k_{eff} \geq 1$ . TSAC 3.1.6.B.1.1 was entered to verify the shutdown margin (SDM) within one hour and TSAC 3.1.6.B.2 was entered to restore control bank sequence and overlap to within limits within two hours. The SDM was verified at 2124 and TSAC 3.1.6.B.1.1 was met. At 2250 the required action for TSAC 3.1.6.B.2 was determined to have not been met within the allowed completion time. As a result, TSAC 3.1.6.C was entered. This action statement requires the reactor to be in Mode 2 with  $k_{eff} < 1.0$ , with a completion time of six hours. At 0530 on April 6, 2003 (one hour lost to Daylight Saving Time), Unit 2 entered Mode 3 and the LCO 3.1.6.C.1 was considered met. Equipment performed as expected during this reactor shutdown.

The NRC was notified of this event in accordance with 10 CFR 50.72 (b)(2)(i) at 0942 on April 6 (EN 39738). An update to this notification was transmitted to the NRC Operation Center at 2222 EDT on April 6 to advise that the Nuclear Management Company had issued a news release on the plant shutdown.

Following investigation and repair of the conditions which lead to the loss of vacuum and the manual turbine trip, Unit 2 commenced a reactor startup at 0152 on April 8, 2003. The reactor went critical at 0327 on April 8<sup>th</sup> and subsequently returned to full power at 0352 on April 10, 2003. The rod drive system performed as expected during this start up and return to full power.

**Cause:**

Bank "D" being one step off of ideal for bank group stepping and Bank Sequence count is a well documented occurrence at PBNP. This occurrence stems from the fact that Bank "D" has only one group of rods, whereas the Rod Control Logic cabinet is always checking for two groups moving, even if the second group is a non-existent or "phantom group". (See Component and System Description). Since there is no control room indication of the state of the "phantom group", the rod control system can sometimes be in the wrong state and end up making Control Bank "D" one step off compared to the expected count sequence. The fact that there is no indication in the control room for the current state of the "phantom group" on Control Bank "D", contributes to the possibility of this bank being left in the incorrect cycling state for correct Bank sequence functioning. Although some procedures have the operators cycle the rods in an attempt to correct this condition, there is still not a 100% assurance (from Control Room indication) that the correct state for the "phantom group" of Control Bank "D" has been accomplished.

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Additional considerations that contributed to the decision to proceed with this reactor shutdown were the facts that:

- The reactor was already in Mode 2 with power less than 5%.
- The trouble shooting and corrective actions to recovery from the partial loss of vacuum and manual turbine generator trip was expected to take several days.
- Development of a procedure to realign the bank sequence to 125 steps was not completed within the six hour TSAC completion time.

**Corrective Actions:**

1. As discussed in the Event Description, the Unit 2 reactor was placed in Mode 3 within the required Technical Specification action time. This negated the need to immediately correct the one step overlap error. An engineering evaluation (2003-0011) was completed to fully explain this occurrence and to provide assurance that the rod control system was working as expected. During the subsequent reactor start up on April 8, the rod drive cabinets were reset and the rod functions, including the Bank Sequence Count, performed as expected during the ascension to full power.
2. Operation's procedures OP 3A, "Power Operation to Hot Standby," TS-5, "Rod Exercise Test Unit 1", and TS-6, "Rod Exercise Test Unit 2," have been changed to include a check of the Master Cyclor card indication in the Rod Drive Control Logic cabinet (which is located outside the Control Room in the Rod Drive Room) for the rods to be in Group 2 mode before the Bank Overlap counter is reset. This will ensure that the Bank Overlap cycles correctly after these evolutions.
3. *Engineering is working with Operations to create a standard operating procedure to direct alignment of rod banks if misalignment occurs as the result of rod movement due to situations other than those covered in Item 2 above.*

**Component and System Description:**

The rod cluster control assemblies (RCCAs) at PBNP are divided among control banks and shutdown banks. Each bank may be further subdivided into two groups to provide for precise reactivity control. A group consists of two or more RCCAs that are electrically paralleled to step simultaneously. When a bank consists of two groups, the groups are moved in a staggered fashion, but always within one step of each other. Control banks A and C and shutdown bank A consist of two groups each, while control banks B and D and shutdown bank B each consist of a single group. Limits on control rod insertion have been established, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are preserved.

The limits on control banks sequence, overlap, and physical insertion, as defined in the COLR, must be maintained because they serve the function of preserving power distribution, ensuring that the SDM is maintained, ensuring that ejected rod worth is maintained, and ensuring adequate negative reactivity insertion is available on trip. The overlap between control banks provides more uniform rates of reactivity insertion and withdrawal and is imposed to maintain acceptable power peaking during control bank motion. The control bank sequence, overlap, and physical insertion limits shall be maintained with the reactor in Modes 1 and 2 with  $k_{eff} \geq 1.0$ . These limits must be maintained, since they preserve the assumed power distribution, ejected rod worth, SDM, and reactivity rate insertion assumptions.

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

Applicability in Modes 2 with  $K_{eff} < 1.0$  and Modes 3, 4, and 5 is not required, since neither the power distribution nor ejected rod worth assumptions would be exceeded in these Modes. Operation within the subject LCO limits will prevent fuel cladding failures that would breach the primary fission product barrier and release fission products to the reactor coolant in the event of a loss of coolant accident (LOCA), loss of flow, ejected rod, or other accident requiring termination by a Reactor Trip System (RTS) trip function.

**Safety Assessment:**

At the time the Unit 2 control bank "C" and "D" bank sequence count was discovered to be one step above the sequence difference limit of 125 steps, the reactor was already in Mode 2 with power less than 5%. At this low power level, the impact on power distribution and localized in-core power peaking during control rod motion due to this one step sequence count difference would have been insignificant. Accordingly this event was of low safety significance and the impact on the public health and safety was negligible.

This event has also been evaluated under the criteria in 10 CFR 50.73(a)(2)(v) and determined not to be a failure that could have prevented fulfillment of a safety function; therefore, this event is not a safety system functional failure.

**Similar Occurrences:**

A review of recent LERs (past three years) identified the following event which involved a reactor shutdown required by the Technical Specifications:

**LER NUMBER****Title**

301/2002-001-00

Completion of Unit 2 Shutdown Required by TS LCO 3.5.2.Action B.1