February 13, 2006

NRC 2006-0024
10 CFR 50.73

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington DC 20555

Point Beach Nuclear Plant Unit 1
Docket No. 50-266
License No. DPR-24

Licensee Event Report 266/2005-008-00
Manual Reactor Trip and Auxiliary Feedwater Actuation due to Circulating Water Pump Failure

Enclosed is Licensee Event Report (LER) 266/2005-008-00 for Point Beach Nuclear Plant Unit 1. LER 266/2005-006-00 describes the December 13, 2005, manual reactor trip due to a loss of main condenser vacuum caused by a mechanical failure of the operating circulating water pump. This condition is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A).

This submittal contains no new or revised regulatory commitments.

Dennis L. Koehl
Site Vice-President, Point Beach Nuclear Plant
Nuclear Management Company, LLC

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW



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NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 6-30-2007

Estimated burden per response to comply with this mandatory 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 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, (3150-0066), 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)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| POINT BEACH NUCLEAR PLANT UNIT 1 | 05000266 | 1 of 4 |

TITLE (4)

## MANUAL REACTOR TRIP AND AUXILIARY FEEDWATER ACTUATION DUE TO CIRCULATING WATER PUMP FAILURE

| 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 |
| 12 | 13 | 2005 | 2005 | -- 008 -- | 00 | 2 | 13 | 2006 | FACILITY NAME | DOCKET NUMBER |

| OPERATING MODE (9) | 1 |
|---|---|
| POWER LEVEL (10) | 100 |

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)

| | | | |
|---|---|---|---|
| 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) | X 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 Specify in Abstract below or in NRC Form 366A |
| 20.2203(a)(2)(iii) | 50.46(a)(3)(ii) | 50.73(a)(2)(v)(C) | |
| 20.2203(a)(2)(iv) | 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) |
|---|---|
| W. Zipp | 920-755-6894 |

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

| CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX |
|---|---|---|---|---|---|---|---|---|---|
| E | SG | P | WEST | Y | | | | | |

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

ABSTRACT

This report describes the December 13, 2005, manual reactor trip due to a loss of main condenser vacuum caused by a mechanical failure of the operating circulating water pump. Major plant systems responded normally, including an auxiliary feedwater actuation due to the resultant low steam generator level. This condition was reported to the NRC via the Emergency Notification System on December 13, 2005 (EN# 42199).

**Event Description:**

On December 13, 2005, the Unit 1 inboard circulating pump [P], 1P-030B, mechanically failed due to fatigue failure of the bolts in the coupling [CPLG] between the pump and motor [MO]. The motor continued to run uncoupled. Unit 1 main condenser [COND] vacuum began lowering rapidly followed by the sound of steam in the turbine hall [NM]. At 0339, the operating crew manually tripped the Unit 1 reactor [RCT] and initiated Procedure EOP 0, "Reactor Trip or Safety Injection". During the performance of EOP 0, the main steam isolation valves (MSIVs) [ISV] were shut to isolate the source of steam. Auxiliary feedwater [BA] actuated as designed due to the resultant low steam generator [SG] water level.

At 0346 operators identified that the 1P-30B circulating water pump was not running. However, control room indicators [MCBD] showed that the breaker [52] remained shut. At 0347, the crew placed 1P-30B circulating water pump control switch [JS] to stop, which opened the breaker and stopped the pump motor. The failure mechanism of the pump was that the coupling bolts between the pump and motor had failed due to fatigue. This failure was consistent with the observed indications in the control room of reduced current to the pump.

Unit 1 was placed in a stable condition in Mode 3. All systems functioned as designed during the transient, with the exception of the audible nuclear instrumentation [IG] monitor [MON] in the control room, which necessitated a manual start. The rupture discs on the main condenser were ruptured due to condenser overpressure, which caused a low pressure steam release into the turbine hall.

This condition was reported to the NRC via the Emergency Notification System on December 13, 2005 (EN# 42199).

**Component and system Description:**

Circulating Water System

The circulating water system [SG], described in FSAR 10.2, circulates water from Lake Michigan through the main condensers to condense the steam exhausting from the turbines. The water is discharged back to the lake through discharge flumes. Two circulating water pumps per unit are used to circulate the water. The circulating water system also supplies cooling water to the condensate cooler for maintaining the main generator hot gas temperature.

The circulating water intake system, common to both units, is designed to provide a reliable supply of Lake Michigan water, regardless of weather or lake conditions, to the suction of four circulating water pumps, six service water pumps and two fire water pumps. The pumphouse is Class I. The intake crib is located 1750 feet from the shore in a water depth of 22 feet. The structure consists of two annular rings of 12-inch structural steel H pile driven to a minimum depth of 23 feet below lake bed and reinforced with walers fabricated from 12 inch structural steel H pile. The annulus is filled with individually placed limestone blocks having two approximately parallel surfaces and weighing between 3 and 12 tons. The structure has an outside diameter of 110 feet, an inside diameter of 60 feet and a top elevation of approximately -11'-0". Water enters the intake crib primarily through the 60-foot opening above the intake cones. The 60-foot opening is covered with a trash rack having approximately 7 inch x 18 inch openings. The intake crib has been designed to reduce the likelihood of ice blockage during the wintertime.

Water flows from the intake crib to the pumphouse forebay through two 14-foot diameter, corrugated, galvanized, structural plate pipes buried to a minimum depth of 3 feet below lake bed. Flow through either pipe can be reversed during winter operation to recirculate warm condenser discharge water to the intake to prevent freezing in the system. Water flows from the forebay through bar grates and through traveling screens having 3/8 inch mesh to the suction of the pumps.

Auxiliary Feedwater (AFW) System

The AFW System automatically supplies feedwater to the steam generators to remove decay heat from the Reactor Coolant System upon the loss of normal feedwater supply. The AFW pumps provide cooling water to the steam generator secondary side via connections to the main feedwater (MFW) piping inside containment. The steam generators function as a heat sink for core decay heat. The heat load is dissipated by releasing steam to the atmosphere from the steam generators via the main steam safety valves (MSSVs) (LCO 3.7.1) or atmospheric dump valves (LCO 3.7.4). If the main condenser is available, steam may be released via the steam bypass valves and recirculated to the CST.

**Event Analysis and Safety Significance:**

The safety significance of this condition was minimal. The plant responded properly to the manual reactor trip and all safety systems operated as designed.

**Cause:**

The loss of condenser vacuum and a turbine and reactor trip was caused by the 1P30B Circulating Water Pump failure.

The circulating water pump's lower shaft sleeve failed directly above the guide vane flanged connection. The shaft sleeve failure caused an imbalance within the pump which resulted in a fatigue failure of the pump to motor coupling bolts. The preliminary determination is that the failure of the lower shaft sleeve was the result of age and fatigue from imbalance and looseness due to increased impeller and bearing clearances in the pump.

Historically, the circulating water pumps at PBNP have been very reliable. There have been no other circulating water pump failures that have resulted in a plant trip. The failure is classified as a maintenance preventable functional failure (MPFF). The pumps have normally been reassembled with wear clearances greater than original manufacturer tolerances following routine maintenance inspections. NMC staff initiated an evaluation regarding replacement of the circulating water pumps or refurbishment to original tolerances.

**Corrective Action:**

Unit 1 was placed in a stable condition in Mode 3. The main condenser rupture disks were replaced. The remaining operable circulating water pump (1P-30A) was evaluated and started to restore circulating water flow to the condenser. Following completion of the reactor post-trip review, an evaluation determined that Unit 1 was safe to restart. The reactor was taken critical and the unit was returned to full power.

Interim Corrective Actions:

The intermediate term corrective action was to evaluate the physical failure mechanism and repair the 1P-30B circulating water pump. Repair activities include replacement of the coupling and coupling bolts in pump 1P-30B.

Corrective Actions to Prevent Recurrence:

Actions being planned to prevent recurrence include evaluating the need to remove coupling bolts from the other three circulating water pumps (1P-30A, 2P-30A, and 2P-30B) to check for cracks and assess replacement as necessary.

Additional actions being considered include evaluating the need to replace or refurbish pump 1P-30B to bring all tolerances back to within original manufacturer's tolerances to eliminate looseness and evaluating the need to replace or refurbish pumps 1P-30A, 2P-30A and 2P-30B to bring all tolerances back to within original manufacturer's tolerances to eliminate looseness.

**Previous Similar Events**:

A review of recent LERs (past three years) identified four events that involved automatic or manual reactor trips:

| LER Number | Title |
|---|---|
| 266/2003-002-00 | Reactor Trip due to Failure of "1G06" Rod Drive Motor Generator Voltage Regulator |
| 301/2003-004-00 | Reactor Trip due to Failure of "B" Main Feed Pump |
| 301/2003-005-00 | Manual Safety Injection and Reactor Trip due to Overcooling Transient |
| 301/2004-002-00 | Concerns with Diver Safety Results in Manual Reactor Trip |