Wisconsin Electric
POWER COMPANY

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VPNPD-93-087
NRC-93-052

April 19, 1993

Document Control Desk
U.S. NUCLEAR REGULATORY COMMISSION
Mail Station P1-137
Washington, DC 20555

Gentlemen:

DOCKETS 50-266 AND 50-301
LICENSEE EVENT REPORT 93-003-00
NONCONSERVATIVE SETPOINTS FOR THE
LOW TEMPERATURE OVERPRESSURE SYSTEM
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

Enclosed is Licensee Event Report 93-003-00 for Point Beach Nuclear Plant, Units 1 and 2. This report is provided in accordance with 10 CFR 50.73(a)(2)(ii)(B), "Any event or condition...that resulted in the nuclear power plant being in a condition that was outside the design basis of the plant."

This report describes a condition where the setpoints for the Low Temperature Overpressure system were nonconservative.

Please contact us if there are any questions.

Sincerely,

Bob Link
Vice President
Nuclear Power

KVA/jg

Attachment

cc: NRC Resident Inspector
NRC Regional Administrator

NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Point Beach Nuclear Plant, Unit 1	0 5 0 0 0 2 6 6	1 OF 0 9

TITLE (4)

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)
0 3	1 9	9 3	9 3	—	0 0 3	—	0 0	0 4	1 9	9 3	PBNF, Unit 2	0 5 0 0 0 3 3 1
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OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
N		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
1 0 0		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	X 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	TELEPHONE NUMBER
	AREA CODE
Gregg Morin Project Engineer - Quality Support	4 1 4 2 2 1 - 3 9 5 9

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

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 fifteen single-space typewritten lines) (16)

ABSTRACT:

Wisconsin Electric Power Company has discovered a nonconservative condition associated with the Point Beach Nuclear Plant Low Temperature Overpressure system. The location of the reactor coolant system pressure transmitters was not considered in the Low Temperature Overpressure system setpoint development analysis. For Point Beach Nuclear Plant Units 1 and 2, the pressure difference across the reactor core is 63 psid with two reactor coolant pumps in operation, and 25 psid with one reactor coolant pump operating. After taking safety margins into account, the setpoint is approximately 34 psig too high to operate both reactor coolant pumps throughout the entire temperature range during the worst case mass input transient. During conditions when the Low Temperature Overpressure system is in service, reactor coolant pressure may not be limited to below the plant operating curves in Point Beach Technical Specification Figures 15.3.1-1, "Heat-up Limitations," and TS 15.3.1-2, "Cooldown Limitations."

EVENT DESCRIPTION:

On March 19, 1993, Wisconsin Electric Power Company (WE) received Westinghouse Nuclear Safety Advisory Letter NSAL-93-005B, "Cold Over-pressure Mitigation System (COMS) Nonconservatism," dated March 10, 1993. The letter indicates that the pressure difference between the wide-range pressure transmitter and the reactor vessel was not included in the analyses for determining the COMS setpoint. This pressure difference occurs during reactor coolant pump (RCP) operation causing reactor vessel pressure to be greater than that seen by the wide range pressure transmitters.

The letter identified two nonconservatisms:

1. For the design basis mass injection transient under normal full flow circumstances, the pressure at the reactor vessel core midplane elevation (used for Appendix G pressure limits) is anticipated to be less than 100 psi above that measured at the wide-range pressure instrument.

2. The design basis heat input transient for COMS is defined as the plant is initially operating with all reactor coolant pumps (RCPs) off and is cooling down on the residual heat removal (RHR) system. This creates a secondary-to-primary temperature difference. One RCP is then started, which results in reverse heat transfer from the steam generator into the RCS and causes a pressurization transient. If the RCP is started in the same loop as the wide-range pressure transmitter used to control one of the PORVs, the transmitter will measure a lower pressure than the reactor vessel by approximately 25 psi.

Westinghouse Letter NSAL-93-005B was sent to utilities which did not hire Westinghouse to calculate the plant specific COMS setpoints, but received Westinghouse report, "Pressure Mitigating Systems Transient Analysis Results," dated July, 1977 which contains a generic methodology for COMS setpoint calculations. A separate letter, NSAL-93-005A with the same title and issue date, was sent to those utilities that did hire Westinghouse to perform the plant specific COMS setpoint calculations. Westinghouse Letter NSAL-93-005A lists differential pressure values for 2, 3, and 4 loop plants, which were calculated based on a conservative set of assumptions for possible plant conditions. The differential pressure listed for 2 loop plants with both RCPs operating is 63 psi.

Although WE did not hire Westinghouse to perform the COMS setpoint calculations for PBNP, we have confirmed with Westinghouse that the 63 psi differential pressure across the core is applicable to PBNP Units 1 and 2 with both RCPs operating, and that a 25 psi differential pressure is applicable for operation with one RCP. After taking safety margins into account, the existing setpoint of the PBNP COMS system is approximately 34 psig too high to maintain RCS pressure within the limits of the plant operating curves in PBNP Technical Specification Figures 15.3.1-1, "Heat-up Limitations," and TS 15.3.1-2, "Cooldown Limitations," during the worst case mass input transient, below approximately 152°F, with both RCPs in operation.

COMPONENT AND SYSTEM DESCRIPTION:

The Cold Overpressure Mitigating System at PBNP is called the Low Temperature Overpressure (LTOP) System. This system relieves pressure during periods of solid water operation and when the system temperature is below the value permitted to perform the primary system leak test (360°F). This system uses the pressurizer power-operated relief valves (PORVs) to relieve overpressure conditions.

There are two PORVs in each unit at PBNP. A four inch line that penetrates the top of the pressurizer reduces to a three inch line that branches to the two PORVs (PCV-430 and PCV-431C). The valves relieve to the pressurizer relief tank. Each PORV is controlled by an "energize to open" solenoid valve. The solenoid valve supplies instrument air to the diaphragm chamber of the PORV. The PORV fails shut on loss of air. Instrument air is backed up by a locally-mounted nitrogen supply.

The pressure mitigating system is configured in 2 trains. When the system is enabled, each train will open a PORV in response to a high pressure condition. One train senses pressure by the wide range reactor coolant system pressure instrument to open PCV-430. The wide range RCS pressure instrument, PT-420, is located on the hot leg of loop 'A'. The other train senses pressure by the pressurizer pressure instrument, PT-493, to open PCV-431C.

By procedure, the LTOP system is enabled during cooldown prior to reducing temperature below the minimum allowable for the primary system leak test (360°F). The system is enabled by placing keylock switches in the OPERATE position, and will remain enabled until either the RCS is opened to atmosphere or temperature is increased above 370°F.

When the LTOP system is enabled, and either the RCS pressure instrument bistable (PC-420C) or the pressurizer pressure instrument bistable (PC-493A) trips when pressure exceeds 415 psig, the respective PORV solenoid is energized to open the valve. Prior to actuation, the "low temperature overpressure" alarm will annunciate at 400 psig increasing pressure.

Wisconsin Electric performed the LTOP setpoint analysis internally. This analysis was included in the NRC submittal of final details for the Point Beach pressure mitigating system dated July 28, 1977, and revised in October 28, 1977. The NRC performed a safety evaluation and concluded that the system provided adequate protection from overpressure transients. This safety evaluation was dated May 20, 1980. In this evaluation the NRC approved a setpoint of 425 psig for the power operated relief valves based on the following:

1. The use of the zero degree heat-up curve is allowed since most pressure transients occur during isothermal metal conditions.

2. The predicted maximum pressure transient is the sum of the overshoot magnitude and the setpoint magnitude.

3. The worst case transient was a mass input transient resulting from an inadvertent start of a single safety injection pump. The calculated pressure overshoot was less than or equal to 94.5 psig. With a setpoint of 425 psig, the predicted maximum pressure for the worst case mass input transient is calculated to be 519.5 psig.

4. Only one PORV was assumed to open.

5. No credit was taken for the RHR relief valves.

6. The Appendix G limits were not exceeded for the worst case mass input transient.

7. The heat input transient is less limiting than the mass input transient.

PBNP Technical Specifications Section 15.3.15, "Overpressure Mitigating System Operations," states that whenever the reactor coolant system is not open to the atmosphere and the temperature is less than the minimum pressurization temperature for the inservice pressure test, both PORV's are operable at a setpoint of $\leq$ 425 psig. As stated in PBNP Setpoint Document, STPT 2.3, Section 1.2, the actual setpoint for the PORV's is 415 psig. With a 415 psig setpoint and two RCP's running, the actual relief setpoint occurs when the pressure on the reactor vessel wall is

478 psig (415 + 63 = 478). With a maximum pressure overshoot of 94.5 psig, the maximum pressure that the vessel wall could experience is 572.5 psig.

The plant operating curves in PBNP TS Figures 15.3.1-1 and 15.3.1-2 specify pressure and temperature limits to protect the reactor vessel against nonductile failure. These curves were developed using the methods of ASME Code Section III (1974 Edition), Appendix G, "Protection Against Nonductile Failure." PBNP TS Section 15.3.1, "Reactor Coolant System," Specification B.1, requires RCS temperature and pressure to be maintained within the limits of these curves during heat-up, cooldown, criticality, and inservice leak and hydrostatic testing.

CAUSE AND CORRECTIVE ACTION:

The cause of this event is the failure to recognize the RCP induced pressure difference between the wide-range pressure transmitter and the reactor vessel when the plant-specific LTOP setpoints for PBNP Units 1 and 2 were calculated.

A Manager's Supervisory Staff (On-Site Review Committee) meeting was held at PBNP on March 23, 1993, to decide on a course of action to facilitate the Unit 1 shutdown for the Spring 1993 annual refueling and maintenance outage.

The following alternatives were considered:

1. Seek NRC approval to apply the American Society of Mechanical Engineers (ASME) Section XI Code Case N-514 on Low Temperature Overpressure Protection.

2. Reduce the PORV setpoint when the LTOP system is enabled.

3. Take credit for the residual heat removal (RHR) relief valve capacity.

4. Restrict the number of reactor coolant pumps in operation below a defined RCS temperature.

Each of these options was evaluated and the results are described below:

ASME Section XI Code Case N-514

ASME Section XI Code Case N-514 states that LTOP systems shall limit the maximum pressure in the reactor vessel to 110% of the pressure determined to satisfy Appendix G of Section XI, Article G-2215. Article G-2215 is used in developing the plant specific heat-up and cooldown curves. If the N-514 Code Case were applied to PBNP, the maximum allowable pressure on the reactor vessel wall would be limited to 592.9 psig. This is above the maximum pressure that the vessel could experience in the worst case mass input transient (572.5 psig). Therefore, if the code case were applied, the current Technical Specification LTOP setpoint is adequate and no further changes would be necessary. Although Code Case N-514 is fully approved through the ASME Board of Nuclear Codes and Standards, it has not been formally approved by the NRC.

This option was not pursued as a short-term corrective action because NRC approval of the Code Case could not be obtained prior to the scheduled shutdown of Unit 1 for refueling (March 27, 1993). However, as discussed below, it will be pursued as a long-term corrective action.

Reducing the PORV Setpoints

Reducing the PORV setpoints would allow operation of two RCPs throughout the entire temperature range. In this case, the LTOP setpoint, plus the differential pressure due to the operation of two RCPs (63 psid) and the maximum overshoot of the worst case mass input transient (94.5 psig), must be less than the minimum pressure on the 0° heat-up curve of TS Figure 15.3.1-1 (539 psig). Therefore, the setpoint must be at or below 381 psig (setpoint + 63 + 94.5 = 539, setpoint = 381.5). This option was not pursued because it would create a narrow pressure band for plant operation and could increase the potential for LTOP actuations.

Take Credit for RHR Relief Valves

In order to take credit for the RHR relief valves as part of the LTOP system, a calculation must be performed to determine the amount of overshoot that would result during the worst case mass input transient. This option was not pursued because the calculation could not have been performed internally and it would not have been cost effective to have the calculation performed by a vendor prior to the start of the Unit 1

outage. Additionally, the licensing implications would have had to be addressed as the safety evaluation for our LTOP system does not take credit for the RHR relief valves.

Restrict the Number of RCP's in Operation

The maximum pressure that the reactor vessel wall could experience during a mass input transient with two RCPs operating of 572.5 psig exceeds the 0° heat-up curve of TS Figure 15.3.1-1 at approximately 151.5°F. If RCP operation is restricted to one RCP below this temperature, the 0° heat-up curve would not be exceeded at any temperature. The differential pressure across the core with one RCP in operation is 25 psid. With an LTOP setpoint of 415 psig, a maximum overshoot of 94.5 psig, and a differential pressure of 25 psid, the maximum pressure the reactor vessel wall could be exposed to during the worst case mass input transient is 534.5 psig (415 + 94.5 + 25 = 534.5). This is below the most limiting point on the 0° heat-up curve of 539 psig. Therefore, it was decided to maintain the existing LTOP setpoint of 415 psig and conservatively limit RCP operation below 160°F, RCS cold leg temperature, to one RCP.

The following short-term corrective actions have been or will be taken and apply to both units at PBNP:

1. A temporary change was made to Operating Procedure OP-3C, "Hot Shutdown to Cold Shutdown," on March 24, 1993, to ensure that one RCP is secured when RCS cold leg temperature is less than or equal to 160°F, and that its breaker is racked out and red-tagged.

2. Operations Special Order (OSO) PBNP 93-004, "Reactor Coolant Pump Operation, Cold Shutdown," was issued on March 26, 1993, which stated that only one RCP may be operated below 160°F cold leg temperature, and that if a pump is operating and it is desired to operate the other pump, the operating pump must be secured prior to starting the idle pump.

3. Entries were made in the Operations Night Order Book on March 19, 23, and 25, 1993, to alert operators to the issue, and on March 26, 1993, to inform operators of OSO PBNP 93-004 and emphasize the restriction on RCP operation below 160°F.

The following long-term corrective actions will be taken and apply to both units at PBNP:

1. We will seek NRC approval to apply ASME Section XI Code Case N-514 to PBNP Units 1 and 2. This request will be forwarded under separate cover.

2. A permanent change will be made to OP-1A, "Cold Shutdown to Low Power Operation," to require the control switch for the idled RCP be red-tagged out when RCS cold leg temperature is less than 160°F. This will prevent operation of two RCPs below 160°F, but will better facilitate pump shifts for chemistry and maintenance purposes. This action will be completed prior to RCP operation for the Unit 1 heat-up following the maintenance and refueling outage.

3. A permanent change will be made to OP-3C to require the control switch for the idled RCP be red-tagged out when RCS cold leg temperature is less than 160°F. This action will be completed by June 1, 1993. The temporary change discussed above will remain in effect until that time.

REPORTABILITY:

This Licensee Event Report is being submitted in accordance with the requirements of 10 CFR 50.73(a)(2)(ii)(B), "Any event or condition...that resulted in the nuclear power plant being in a condition that was outside the design basis of the plant."

Although not specifically required by 10 CFR 50.72(b)(2)(i), a 4 hour NRC notification was made at 1655 hours on March 19, 1993, based on a conservative interpretation of the regulation.

SAFETY ASSESSMENT:

Operating within the acceptable region defined by the plant operating curves in PBNP TS 15.3.1-1 and 15.3.1-2 protects the reactor vessel against nonductile failure. The LTOP system is used to prevent pressure from exceeding these curves during periods of solid water operation and low temperature (<360°). Administrative restrictions have been implemented to account for the differential pressure across the reactor core during periods when the LTOP system is enabled. The limits of the plant operating curves were not exceeded and there was no release of radioactivity to the environment as a result of this event. The health and safety of the public were not impacted by this event.

GENERIC IMPLICATIONS:

This issue applies to licensees that used the generic Westinghouse methodology to perform COMS setpoint calculations and failed to account for the pressure difference between the reactor vessel and the wide-range pressure transmitter.

SIMILAR OCCURRENCES:

There are no known occurrences similar to this event at PBNP.