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POWER COMPANY

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10 CFR 50.73

November 28, 1989

U. S. NUCLEAR REGULATORY COMMISSION
Document Control Desk
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Washington, D. C. 20555

Gentlemen:

DOCKET 50-301
LICENSEE EVENT REPORT 89-003-01
SAFETY INJECTION ACCUMULATOR LEVEL
DETECTOR INSTRUMENT FAILURE
POINT BEACH NUCLEAR PLANT, UNIT 2

Enclosed is Licensee Event Report 89-003-01 for Point Beach Nuclear Plant, Unit 2. This report is provided in accordance with 10 CFR 50.73(a)(2)(i), "Any operation prohibited by plant Technical Specifications."

This report further describes circumstances surrounding a failure of a component in the safety injection accumulator level indication circuitry. A faulty level detector was replaced and the system was returned to service.

If any further information is required, please contact us.

Very truly yours,

C. W. Fay
Vice President
Nuclear Power

Enclosure

Copies to NRC Regional Administrator, Region III
NRC Resident Inspector

IE22
11

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/85

LICENSEE EVENT REPORT (LER)

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

TITLE (4): Safety Injection Accumulator Level Detector Instrument Failure

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 7	1 2	8 9	8 9	0 0 3	0 1	1 1	2 8	8 9		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): N

POWER LEVEL (10): 1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

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)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
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	TELEPHONE NUMBER
C. W. Fay, Vice President - Nuclear Power	AREA CODE 4 1 4 2 2 1 - 2 8 1 1

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	
B	B P	L E	M 0 4 0	Y		B	B P	L E	M 0 4 0	N	
B	B P	L E	M 0 4 0	N							

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)

On July 12, 1989, during normal 100% power conditions, operators were completing a routine level fill of the "B" Safety Injection Accumulator. Accumulator Tank "B" level indicating channel 2LE-935 was out of service, pending corrective maintenance. Redundant accumulator level indicating channel 2LE-934 was in operation, along with two other channels from the "A" Safety Injection Accumulator.

During the fill operation, the remaining operable "B" tank level channel 2LE-934 began to indicate spuriously (indications of minor level changes resulted in relatively large pressure changes). The fill operation was suspended and level channel 2LE-934 was declared inoperable. Operators gained level indication for the "B" accumulator tank by cross-connecting the vent and fill lines between the "A" & "B" tanks. As the pressures and levels equalized in both tanks, level could be read from the operable level indicator 2LE-939 on the "A" tank. (Redundant "A" tank channel 2LE-938 became unreliable during the event).

During the equalization process, level in the "A" accumulator approached the Tech Spec high level limit. The level was adjusted to maintain the proper level band. Levels would have equalized above Tech Spec high limit had the "A" accumulator not been adjusted. It was therefore concluded that the "B" accumulator tank level had exceeded the high level limit cited in Tech Spec 15.3.3.A.1.b.

SYSTEM AND EQUIPMENT DESCRIPTION:

The accumulator tanks are a passive engineered safety feature, designed to provide the first phase of injection during large break loss of coolant accidents. They contain borated water (2000 ppm) and are pressurized to at least 700 psig. Each tank is connected to a reactor coolant system cold leg. The tank is isolated during normal operation by a series of swing-disc check valves. Should the reactor coolant system pressure fall below the accumulator pressure, the accumulators would rapidly reflood the core. There is no dependence on normal or emergency power sources, nor the dependence on the receipt of an actuation signal.

The design capacity of the accumulator tanks is based on the assumption that the volume from one tank would fill the reactor vessel to a point of flooding one half of the core height; while the flow from the redundant tank is assumed to spill through the ruptured loop. This ensures cooling to the core while the safety injection pumps load onto the safeguards diesel busses and injection is initiated (approximately 20 seconds).

Because the accumulator tanks are a passive design, the static head of the borated water and the nitrogen pressure in the tank are critical to their discharge at a proper setpoint. The tank water volume and pressure are administratively controlled with a daily shift operations surveillance log. Level is decreased by draining the accumulator to the reactor coolant drain tank. Level is increased with the use of a safety injection pump. Nitrogen is supplied via a header at the top of the tank. The fill and vent headers have the capability of being cross connected to equalize the levels and pressures of the two accumulator tanks.

The level band for the borated water volume is measured with the use of two independent detectors on either side of the accumulator tank. The level detector is manufactured by Magnetrol International, Inc., of Downers Grove, Illinois (manufacturer identifier M040). The detector is part of the KOTRON Series of electronic instruments; model no. X41-1038-004. Capacitance is measured via a sensing rod which is located within the normal operating band of the liquid level. The rod is insulated from the borated water with a plastic-like material known as "halar." The detectors were installed in November of 1987.

The detectors are installed on a 2-inch standpipe attached to the side of the tank. A 3/8" tank "equalizing" line connects the top of the standpipe to the nitrogen space on the accumulator tank.

EVENT DESCRIPTION

On July 12, 1989, during normal 100% power conditions, operators were completing a routine level fill of the "B" Safety Injection Accumulator. Accumulator Tank "B" level indicating channel 2LE-935 was out of service, pending corrective maintenance. Redundant accumulator level indicating channel 2LE-934 was in operation, along with two other channels from the "A" Safety Injection Accumulator.

During the fill operation, the remaining operable "B" tank level channel 2LE-934 began to indicate spuriously (indication of minor level changes resulted in relatively large pressure changes). The pressure in the tank was relieved and a second fill attempt was initiated. Again, an uncharacteristic pressure increase was witnessed. The fill operation was suspended and level channel 2LE-934 was declared inoperable. Operators gained level indication for the "B" accumulator tank by cross-connecting the vent and fill lines between the "A" and "B" tanks. Initially, both "A" accumulator level channels 2LE-938 and 2LE-939 were within the expected band of indication. Channel 2LE-938 was considered unreliable after known differential level changes between accumulator tanks were not reflected accurately by the instrument channel. As the pressures and levels equalized in both tanks, level could be read from the operable level indicator 2LE-939 on the "A" tank.

During the equalization process, level in the "A" accumulator approached the Technical Specification high level limit. The level was decreased to maintain the proper level band. Levels would have equalized above Technical Specification high limit had the "A" accumulator level not been adjusted. It was therefore concluded that the "B" accumulator tank level had exceeded the high level limit cited in Technical Specification 15.3.3.A.1.b.

Instrument and Control technicians were summoned to troubleshoot level indication channel 2LE-935. Water was discovered between the detector sensing rod element and the halar insulator, shorting the detector signal. The level detector was replaced. The level indication channel was calibrated and restored to operation.

CAUSES AND EQUIPMENT RESPONSES

The cause of the level detector 2LE-935 malfunction was attributed to moisture intrusion between the halar insulator and the sensing rod. The moisture intrusion shorted the circuit, causing a resistant path as opposed to a normal capacitance path. The moisture intrusion was due to the design of the detector.

The halar insulator is held in place with a screw threaded to the bottom of the sensing rod element. The insulator is pressed tight to the adapter nut at the top of the detector. However, a waterproof seal to the adaptor nut at the top of the detector is not a design feature for this model. At the time of the modification design, detector model X41-1038-004 was evaluated as the best available in the market. The fact that moisture could intrude between the insulator and sensing rod element was considered but thought not to be highly probable.

As stated earlier, the liquid level is administratively controlled via a shift log. The operating band for the liquid level is approximately 4" to 18" on the detector element. The total length of the element is 24". The high level limit is approximately 8" below the detector seal. Considering the size of the tank, discharge of the safety injection pump, and narrow range of operation which the accumulator level is maintained, there is a potential for flooding (shorting) the sensing rod element of the detector.

Malfunctions occurring with level detectors 2LE-934 and 2LE-938 were attributed to water intrusion into the 3/8" nitrogen sensing line. It is suspected that a slug of water may have been entrapped during accumulator tank relief valve maintenance in November of 1988. During this maintenance activity, the tank was filled to a point above the nitrogen equalizing line as a part of post maintenance testing. Capillary tension and a horizontal tube run could have prevented proper draining of fluid in the nitrogen equalizing line at the completion of the testing. Water in the equalizing line may not be easily detected during normal operations because levels in the accumulator tanks would remain relatively constant. However, when levels are changed (as in a fill operation) level indication could be quite erratic as the static head of water and the nitrogen pressure force the water slug through the tube (nitrogen equalizing line).

CORRECTIVE ACTIONS

The level detector was replaced and level indicating channel 2LE-935 was reestablished for the "B" accumulator tank. At 2019 hours on July 12, the fill and vent header valve lineups were restored to normal operating conditions; approximately 6 hours and 49 minutes after the detector was declared out of service.

The water discovered in the nitrogen equalizing line of level indicating channels 2LE-934 and 2LE-938 was removed by Instrument and Control technicians.

Further testing of both Unit 1 and Unit 2 accumulator level indication channels was conducted. The testing indicated each channel responded properly and within specification.

During Unit 2 Refueling 15, the accumulator level channels were modified with two changes. The first change includes the replacement of the level detectors with improved model 41-1059-104. This model features a design which utilizes a fusion joint to seal the halar insulator to the adapter nut, at the top of the detector. The fusion joint will provide more protection against moisture intrusion. The modified detectors were installed in two level indication channels in Unit 1 in April of 1989 to ensure the design and application are satisfactory. No problems have been evident.

A second modification increased the size of the nitrogen equalizing tubing from the standpipe to the accumulator tank. The existing 3/8" tubing was replaced with 1/2" tubing and horizontal tubing runs were removed. The objective of this modification was to remove the potential for fluid entrapment (due to capillary tension) in the nitrogen equalizing line.

Both modifications were implemented on all four Unit 2 accumulator level indicating channels during the October-November, 1989 refueling outage. As stated previously, two Unit 1 channels (1LE-939 and 1LE-934) have had the detectors replaced with the improved model 41-1059-104. Detector replacement of the two remaining channels, as well as the nitrogen equalizing line modification on all four Unit 1 level indicating channels is scheduled for April of 1990.

GENERIC CONCERNS AND SIMILAR OCCURRENCES

There are no industry generic concerns. The model X41-1038-004 level detector is a unique application for the Point Beach accumulators. The moisture intrusion problem associated with the detector was first recognized on Unit 1 channel 1LE-939 in May of 1988. Since that time there have been three other failures of this model of detector (including this most recent incident).

REPORTABILITY

The Licensee Event Report is provided pursuant to:

10 CFR 50.73 (a)(2)(i) - any operation prohibited by plant Technical Specifications.

Although there is no way to clearly confirm the fact, it is felt that for 3 hours and 32 minutes the volume of water in the "B" accumulator exceeded the maximum established in Technical Specification 15.3.3.A.1.b.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Point Beach Nuclear Plant	0 5 0 0 0 3 0 1	8 9	— 0 0 3	— 0 1	0 6 OF 0 6

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

SAFETY ASSESSMENT

The health and safety of the general public and plant employees were not affected during this event. The accumulators discharge on low reactor coolant system pressure. They rely on differential pressure across the check valve discs for actuation. No failure within the level indicating channel could have prevented the discharge of the accumulator to the reactor coolant system. Throughout the course of event, the accumulators had maintained a sufficient inventory of borated water to fulfill their design function. Because there was a high accumulator level, nitrogen volume would be decreased. If pressure within the accumulator is within specification, the potential exists for an incomplete blowdown of the accumulator contents at the low reactor coolant system pressure setpoint. Since the high level was confined to one of two accumulators, and the level was only nominally high, the overall impact to safety was minimal.