

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)
Point Beach Nuclear Plant

DOCKET NUMBER (2)
0 5 0 0 0

PAGE (3)
1 OF 019

TITLE (4)
Main Steam Isolation Valves Open Without Trip Power Available

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												
0	8	18	8	7	0	0	3	0	0	0	9	1	7	8	7	None	0	5	0	0	0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11):

OPERATING MODE (9)	20.402(b)	20.405(a)	80.73(a)(2)(v)	73.71(b)
POWER LEVEL (10) 0 0 2	20.405(a)(1)(i)	80.36(a)(1)	80.73(a)(2)(v) X	73.71(e)
	20.405(a)(1)(ii)	80.36(a)(2)	80.73(a)(2)(v4)	OTHER (Specify in Abstract below and in Text, NRC Form 365A)
	20.405(a)(1)(iii)	80.73(a)(2)(i)	80.73(a)(2)(viii)(A)	
	20.405(a)(1)(iv)	80.73(a)(2)(ii)	80.73(a)(2)(viii)(B)	
	20.405(a)(1)(v)	80.73(a)(2)(iii)	80.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
C. W. Fay, Vice President-Nuclear Power	411 14 21211-1218111

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)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

During a startup of Unit 2 on August 18, 1987, the unit's two main steam isolation valves (MSIVs) were discovered to be without the DC control power needed to trip the valves closed. The valves were open. The reactor was at 2% power for about five hours before the condition was discovered. Upon discovery, the operator immediately restored control power to the valves thereby returning the trip circuitry to an operable condition. No other safety systems receive power from this power supply.

The cause of the MSIVs being out of service was personnel error in that the power to the solenoid valves was not restored correctly after being removed from service during outage maintenance.

An incident investigation team was appointed to investigate this event and report conclusions and recommendations. This LER includes the pertinent findings of the incident investigation team.

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TEXT (If more space is required, use additional NRC Form 365A's) (17)

BACKGROUND

During the day of August 17, 1987, Unit 2 was in the hot shutdown condition following a trip which occurred on August 16 (see LER 87-002-00, Unit 2 for further details). The main steam isolation valves (MSIVs) were shut manually after the trip to facilitate repairs to three low pressure turbine rupture discs which ruptured during the transient following the trip. Following repairs to the rupture discs and verification of valve operability (see LER 87-002-00), the MSIVs were left open. Later in the morning of August 17, it was decided to have maintenance personnel inspect the internals of the turbine and a moisture separator reheater. For reasons of personnel safety during the inspections, the MSIVs were closed and a "red tag" series was initiated to tag them in the closed position. The tag series provided for tagging the instrument air isolation valve to each MSIV and the DC control power breakers in the control room which supply the instrument air isolation valve supply and vent solenoids.

EVENT DESCRIPTION

After the inspection and maintenance work was completed, the reactor was released for criticality. By approximately 2138 hours on August 17, 1987, the reactor was critical with the MSIVs remaining closed. Between 2138 hours and 2230 hours, it was intended that the MSIVs be returned to service by clearing the tagout series. Two of the tags in the tagout series were inadvertently not removed but the tagout series was assumed to be cleared. These tags required the circuit breakers which supply DC control power to the MSIV trip solenoid valves to be in the open position. Without DC control power, the MSIVs can be opened but are not capable of being closed with either an automatic or manual signal.

At about 2230 hours OP-1C, "Low Power Operation to Normal Operation" was started. The first step in the initial conditions of that procedure requires that the applicable portions of OP-13A, "Secondary System Startup and Shutdown" be completed. OP-13A has a step that requires the MSIVs to be opened and cycled, thereby verifying the valves' operation. Since the MSIVs had been cycled earlier prior to the maintenance inspections, operations personnel decided that the OP-13A requirement to cycle the MSIVs had already been met. The cycling was therefore not performed and the failure to completely clear the tagout series was not identified at that time. At approximately 2305 hours, when the MSIVs were opened, it was not known that the trip circuits for the MSIVs were functionally inoperable because the control power breakers were open. Some time

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TEXT (If more space is required, use additional NRC Form 306A's) (17)

between 0330 and 0400 hours on August 18, 1987, during the continuation of OP-1C, Operations personnel discovered the red tags on the DC control power supply circuit breakers for the MSIV trip solenoid valves. After determining that the red tags should have been removed, the tagout series was completed, the tags were removed, and the breakers were closed, making the MSIV trip circuits operable.

After this incident, a normal course of action at PBNP would have resulted in the operator calling a duty & call superintendent so a 10 CFR 50.72 reportability evaluation could be performed. 10 CFR 50.72 reportability was not considered by the operator discovering the condition, and he therefore made no calls. He did assume an LER would be required and he had a nonconformance report (NCR) on the event initiated. The NCR was issued the afternoon of August 18, 1987.

The operator who found the breakers open between 0330 and 0400 on August 18 sent a written note to the operator responsible for clearing the tagout series who was not scheduled for work until 1500 hours on August 18. Between 1500 and 2300 hours on August 18, the operator who made the tagout error received the note and generated an NCR. The NCR was sent to a responsible staff reviewer in the normal plant mail which was received by the reviewer the afternoon of August 19. The NCR did not clearly state that the MSIVs were inoperable for the period of time that they were open with red tags on the breakers. A review of OP-13A led the reviewer, who thought that the breakers may have been closed instead of open, to mistakenly conclude that the valves had been cycled and were, in fact, operable at the time the red tag problem was found. The staff reviewer determined it was necessary to talk directly with the person who identified the situation. The operator was still assigned to the 2300 to 0700 hour shift so the staff reviewer decided to talk with him the morning of August 20. In the interim, the resident inspector was informed of the circumstances and that an investigation was under way. On August 20, the operators involved in the incident were interviewed and it was determined that, in fact, the breakers for the control power were open and the MSIVs were inoperable with the reactor at 2% power. The decision was then made to notify the NRC duty officer of a probable one hour 10 CFR 50.72 report. Subsequent calculations (see the safety analysis below) verified that for the conditions of the plant at the time, the plant was bounded by the design basis.

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SEQUENCES OF EVENTS

<u>Date</u>	<u>Time</u>	<u>Event</u>
08-16-87	1855	Reactor trip due to lightning strike
08-16-87	1915 (approx)	MSIVs shut for secondary side maintenance - "B" MSIV shuts to within 1 in. of full closed
08-17-87	0515	MSIVs tested per IT-285 to verify both MSIVs were operable, MSIVs left open
08-17-87	0800 (approx)	Tag series written to isolate steam to the turbine hall
08-17-87	0830 (approx)	Tag series reviewed and approved
08-17-87	0955	MSIVs shut
08-17-87	1100 (approx)	MSIVs tagged shut - Instrument air at the MSIV location - DC breakers in control room
08-17-87	2138	Unit 2 reactor critical - Tag series cleared except DC control power breaker tags left in place
08-17-87	2300	Pressure equalized across MSIVs and valves opened - MSIV cycling considered not necessary due to testing at 0515 hours
08-18-87	0158	Commenced turbine startup procedure
08-18-87	0330-0400	Discovered red tags and open power supply breakers with reactor critical at approximately 2% power
08-18-87	0330-0400	Cleared DC control tag series for MSIV power, removed tags, and closed breakers

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SYSTEM DESCRIPTIONS

Each of the two steam generators has an MSIV which is fully open during normal operation. The MSIV is held open by instrument air pressure on an operating cylinder. Each MSIV has four solenoid valves, two in series to isolate the instrument air supply to the operating cylinder after a close signal, and two in parallel to vent the air from the operating cylinder after a close signal allowing the valve to swing shut. Each solenoid has a latch which must be manually reset to return the solenoid valve to the normal operating position. No power is required to reset the solenoid valves and therefore open the MSIVs. The solenoids, once reset, must have DC control power applied in order to trip. Without DC control power, manual closing of the valves may be accomplished by isolating instrument air to the operating cylinder using a manual valve and then using a wrench to open a pipe fitting to vent the operating cylinder pressure to atmosphere.

The DC control power for the MSIV solenoids has no means of providing the control room operator an indication of its energized or deenergized status. The valve does have position indication in the control room but its power supply is different from that of MSIV solenoids. No alarms exist to alert the operator of a deenergized DC control power circuit for the MSIV solenoids.

GENERIC IMPLICATIONS

No generic implications have been identified for this event.

REPORTABILITY

This licensee event report is provided pursuant to 10 CFR 50.73(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."

Although initially the red phone call was conservatively made as a one hour notification because it was assumed that the unit was "in a condition that is outside the design basis of the plant," subsequently analysis (see below) determined this to be overly conservative.

The Energy Industry Identification System component function identifiers for the MSIV solenoid valves are ISV for the isolation valves and VTV for the vent valves. The system identifier for the main steam system is SB.

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TEXT (If more space is required, use additional NRC Form 395A's) (17)

CAUSE

This incident is a result of personnel errors. First, tag series was inadequate in that the tag location sheet did not clearly indicate the location of all tags which had been hung. Second, the tags were cleared in an inappropriate manner. The duty operating supervisor (DOS) asked the auxiliary building auxiliary operator (AO) to clear the tags on the MSIVs. The AO cleared two tags from the MSIV instrument air supply, reset the solenoids and told the DOS he had cleared the tags not specifying which ones or how many. The DOS, with permission from the AO, signed the danger tag location sheet indicating clearance for all four tags, including the two on the DC control power breakers because he thought the tags were located near the MSIVs and that the AO had cleared them (the tag locations were not clear on the sheet). The tag series was then reviewed and cleared by the DSS. Third, because the MSIVs had been cycled the same day, the DOS and DSS on the next shift determined that it was not necessary to completely perform the procedural step which opened and cycled the MSIVs. The cause of the delayed 10 CFR 50.72 reporting was the failure of the operator to make proper notifications to plant management when the condition was discovered.

SAFETY ASSESSMENT

A safety analysis was performed to evaluate the effect of the unavailability of main stop valves (MSIVs) on the final safety analysis report (FSAR) transient analysis. The transients of concern are the main steam line break (MSLB) and the steam generator tube rupture (SGTR).

MAIN STEAM LINE BREAK

The main concern in the MSLB accident analysis is the reactivity excursion caused by an excessive cooldown of the primary coolant. The FSAR analysis assumes that the MSIVs will close within 5 seconds of the demand to close to limit the loss of

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secondary coolant from the "intact" steam generator. The design of PBNP is such that a steam line break anywhere in the steam line can be isolated by the operation of either MSIV or the non-return check valves located downstream of the MSIVs. Between the steam generator and its associated MSIV is a flow restricting orifice which also limits flow during a steam line break that occurs downstream of the orifice. The worst case break that is analyzed in the FSAR is the MSLB upstream of the flow restricter. This worst case assumes:

1. Minimum shutdown reactivity margin assumed in the analysis: 2.77%;
2. Negative moderator temperature coefficient assumed in the accident analysis: -32.39 pcm/°F. (Most negative moderator temperature coefficient at end-of-life for a rodged core at hot zero power);
3. Control rods: most reactive rod stuck out; and
4. Safety injection system: one train of safety injection inoperable.

Assuming the successful operation of the non-return check valves, the maximum credible break flow area with the MSIV inoperable is equal to that analyzed in the FSAR. An appropriate probabilistic estimate of the above event including failure of the non-return check valve is 6.0 E-11. This assumes a 1 E-04 probability for the failure of the non-return check valve to close upon demand, a 2 E-09/hr/ft probability for failure of the pipe, 60 feet of piping upstream of the flow restricting orifice, and an exposure time of 5 hours. Therefore, the inclusion of the failure of the non-return check valve in this accident scenario is considered incredible.

The pipe rupture occurring down stream of the non-return check valves was also analyzed. For this case, the maximum break flow area of 402 square inches is bounded by the 616 square inches of the FSAR worst case analysis. However, since both generators are blowing down, the final total heat removed could be greater than that assumed in the FSAR analysis. This does not affect the power excursion issue, since the safety injection system has time and capacity to inject boron prior to the occurrence of a possible power excursion (due to the lower rate of heat removal from the primary system).

It should also be noted that experience with the MSIVs at Point Beach indicates that, with the high steam flow that would occur with a steam line break, it is likely that the MSIV would "wipe in" and close of its own accord.

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Based upon the above discussion and the actual plant conditions during the event, it is concluded that the unavailability of the MSIVs during an MSLB was bounded by the worst case FSAR safety analysis with respect to an overcooling transient and its associated possible reactivity excursion. Actual plant conditions calculated by our analysis are as follows

1. Approximate available shutdown reactivity: 6.76%;
2. Negative moderator coefficient (265 ppm RCS boron) -20.0 pcm/°F;
3. Control rods: all control rods were operable (none stuck and all had recently been tripped in and withdrawn);
4. Safety injection system: both trains were operable at time of event.

STEAM GENERATOR TUBE RUPTURE

The steam generator tube rupture (SGTR) accident analysis involves the flow of reactor coolant through a steam generator tube to the secondary side coolant of the steam generator. Radioactivity can then be released to the environment either through the condenser downstream of the MSIVs or through the atmospheric steam dump or steam generator safety valves upstream of the MSIVs. Although the FSAR safety analysis assumes the operator will attempt to isolate the steam generator by closing the MSIVs or the turbine stop valves, failure of an MSIV is assumed. These conditions bound the situation described in this LER.

It should also be noted that failure of both MSIVs to fulfill their design function can be mitigated by the use of one of the PBNP emergency operating procedures, ECA-2.1, "Uncontrolled Depressurization of Both Steam Generators."

It is therefore concluded that the condition of PBNP during this event did not pose a health or safety hazard to plant personnel or the general public.

CORRECTIVE ACTIONS

The immediate corrective action to restore the functional operation of the MSIVs was to properly complete clearing the red tag series and close the breakers for the DC control power to the isolation and vent solenoid valves.

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The conservative one-hour 10 CFR 50.72 red phone report was made.

A modification has been initiated to annunciate the loss of DC control power to the MSIVs in the control room. This modification will reduce the probability of this type of condition occurring in the future. It will be performed on Unit 2 by December 1987. Unit 1 will be modified during the spring 1988 refueling maintenance outage. In the interim, the DC breakers are being verified as closed once each day.

The personnel involved in the event are being counselled on the necessary and required adherence to appropriate work practices, proper use of procedures, and the need to contact appropriate personnel in those situations having a potential for reportability. This counselling will be completed by the end of September, 1987.

Within a few days of the discovery of the MSIV condition, a memo from the vice president of the Nuclear Power Department to all department personnel was written emphasizing in the strongest terms the exercise of the greatest of diligence in all work performed.

A special team was assembled to investigate the unavailability of DC control power to the MSIVs as found on August 17, 1987. This investigation resulted in the discovery of facts as indicated in this LER. A number of conclusions and recommendations were reached which address the issue directly as well as addressing programmatic items discovered during the investigation. This final report was given to the manager - Point Beach Nuclear Plant September 4 and was discussed by the Manager's Supervisory Staff September 9 and 11. Implementation of the recommendations is currently being considered.

As can be seen in Cause there were several personnel errors identified during the special team's investigation. The proposed corrective actions would address the areas of concern. These include red tag procedure changes and resultant training and changes in philosophy of procedure use (including signoff) and resultant training. The precise approach in each area will be considered with a firm program and implementation schedule for these additional actions to be developed by the end of December, 1987.

SIMILAR OCCURRENCES

No similar events have occurred at PBNP.



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September 17, 1987

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

Gentlemen:

DOCKET NO. 50-301
LICENSEE EVENT REPORT 87-003-00
MAIN STEAM ISOLATION VALVES OPEN WITHOUT TRIP POWER AVAILABLE
POINT BEACH NUCLEAR PLANT, UNIT 2

Enclosed is Licensee Event Report 87-003-00 for the Point Beach Nuclear Plant, Unit 2. This report describes an event which occurred during a startup of Unit 2 on August 18, 1987. The DC control power to the unit's main steam isolation valve solenoid operators, necessary to trip the valve closed upon an automatic or manually initiated signal, was found to be secured for about five hours while the reactor was at 2% power. This event occurred because of personnel error in clearing a red tag series following outage maintenance. This report is filed under the reporting requirements of 10 CFR 50.73(a)(2)(v)(D) which states, "Any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems needed to . . . mitigate the consequences of an accident."

The condition was identified by plant personnel and immediately corrected. Other corrective actions to preclude recurrence are described in the enclosed report. Our subsequent analysis of the event indicates that potential consequences were bounded by the accident analyses contained in the Point Beach FSAR.

If you have any questions regarding this report, please contact us.

Very truly yours,

Sol Burstein
Vice Chairman of the Board

Enclosure

Copy to NRC Resident Inspector
NRC Regional Administrator, Region III

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