



Point Beach Nuclear Plant  
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PBL 97-0032

January 30, 1997

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

Gentlemen:

DOCKET 50-266 AND 50-301  
LICENSEE EVENT REPORT 96-015-00  
MAIN STEAM SAFETY VALVE LIFT SETPOINTS EXCEED DESIGN BASIS VALUES  
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

Enclosed is Licensee Event Report 96-015-00 for Point Beach Nuclear Plant, Units 1 and 2. This report is provided in accordance with 10 CFR 50.73(a)(2)(ii)(B), "a condition that was outside the design basis of the plant." This report describes an analyzed condition of the Main Steam Safety Valves that could result in a lift setpoint and a main steam peak pressure that exceed the values used in the analysis of the limiting design basis event.

If you require additional information, please contact us.

Sincerely,

A handwritten signature in dark ink, appearing to read 'D. F. Johnson'.

D. F. Johnson  
Manager - Regulatory Services & Licensing

GDA/yce

Enclosure

cc: NRC Resident Inspector NRC Regional Administrator

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## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH  
THIS INFORMATION COLLECTION REQUEST: 50.0 HRS.  
REPORTED LESSONS LEARNED ARE INCORPORATED INTO  
THE LICENSING PROCESS AND FED BACK TO INDUSTRY.  
FORWARD COMMENTS REGARDING BURDEN ESTIMATE  
TO THE INFORMATION AND RECORDS MANAGEMENT  
BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY  
COMMISSION, WASHINGTON, DC 20555-0001, AND TO  
THE PAPERWORK REDUCTION PROJECT

FACILITY NAME (1)

Point Beach Nuclear Plant, Unit 1

DOCKET NUMBER (2)

05000266

PAGE (3)

1 OF 6

TITLE (4)

Main Steam Safety Valve Lift Setpoints Exceed Design Basis Values

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 NAME	DOCKET NUMBER
12	31	96	96	015	00	01	30	97	PBNP Unit 2	05000301
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
N			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)			20.2203(a)(1)			20.2203(a)(3)(i)			X 50.73(a)(2)(iii)	50.73(a)(2)(x)
90			20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)	73.71
			20.2203(a)(2)(ii)			20.2203(a)(4)			50.73(a)(2)(iv)	OTHER
			20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)	Specify in Abstract below
			20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)	or in NRC Form 366A

LICENSEE CONTACT FOR THIS LER (12)

NAME

Glenn Adams, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

(414) 221-4691

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).

X

NO

EXPECTED  
SUBMISSION  
DATE (15)

MONTH

DAY

YEAR

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

On December 31, 1996, with Unit 1 operating at 90% power and Unit 2 in a refueling shutdown condition, licensee engineers determined that the analyzed lift setpoint and full-open pressure of three Main Steam Safety Valves (MSSVs) could result in a steam generator peak pressure that exceeds the value used in the analysis of the limiting design basis event; the Loss of External Electrical Load (LOL). The accident analysis assumed the highest-set MSSV to be full-open at 1159 psig. Empirical data and analyses concluded that newly-discovered testing inaccuracies and estimated temperature effects could result in a full-open pressure exceeding 1159 psig. The cause of this event is related to the lack of margin provided in the original analysis. That analysis assumed a non-conservative MSSV lift setpoint that did not consider the post-testing tolerance in the lift setting, temperature effects, or the potential testing inaccuracies that are allowed by ASME code. New analysis of the LOL event using the aforementioned factors confirmed MSSV operability for the subject MSSVs under all expected operating conditions of the MSSVs (ambient temperatures down to minus 50 degrees Fahrenheit).

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

**Event Description:**

On December 31, 1996, with Unit 1 operating at 90% power and Unit 2 defueled in a refueling shutdown condition, licensee engineers determined that the analyzed lift setpoint and full-open pressure of three Main Steam Safety Valves (MSSVs) could result in a steam generator peak pressure that exceeds the value used in the analysis of the limiting design basis event - Loss of External Electrical Load (LOL). This condition was discovered following a review of test results that we commissioned in response to NRC Information Notice 96-3, "Main Steam Safety Valve Setpoint Variation As A Result Of Thermal Effects". Test results from an offsite laboratory (Wyle Laboratories) indicated the following general factors related to the PBNP MSSVs and related test equipment:

1. The test equipment used at PBNP to test MSSVs in situ (Ultrastar equipment manufactured by AVK) meets the specified test accuracy requirement of ASME OM-1-1981 (+2%/-1%). The laboratory tests found a maximum setpoint deviation of 15 psi (approximately 1%) in the Ultrastar equipment as compared to results from the boiler test equipment. Although this comparison to a controlled laboratory test method is not an accurate confirmation of test accuracy, it provided general assurance that the Ultrastar equipment was performing satisfactorily. Most significantly, the Ultrastar equipment consistently produced a lift setpoint value in the laboratory that was lower than the actual settings determined by boiler test equipment; indicating an apparent test bias in the Ultrastar equipment. This effect would consistently lead to a post-maintenance setting in the field that causes the MSSV to lift at a higher steam pressure than desired. Thus, it was conservatively assumed that an MSSV would actually lift at a pressure that was 15 psi higher than the as-left setting measured during the Ultrastar in situ test.
2. The lift setpoint of the PBNP MSSVs will increase as the ambient temperature drops below the ambient temperature of the in situ test. When the ambient temperature was changed from 90°F to 0°F in the laboratory, the lift setpoint increased by approximately 17 psi. This factor is characteristic of the particular valve type (Crosby Model HA65W) and is independent of the test methodology.
3. The PBNP MSSVs require approximately 1.1% accumulation to achieve full capacity. This information was derived empirically from previous tests conducted at Wyle Laboratories (U2R19). This factor is characteristic of the particular valve type (Crosby Model HA65W) and is independent of the test methodology. Note that this value of accumulation is a more accurate representation of the valve's characteristics than the nominal 3% accumulation value in the original analysis.

When these factors were applied to the as-left setpoints of those MSSVs

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previously tested with the Ultrastar equipment (6 total), engineers discovered that the peak main steam pressure described in the existing accident analysis could be exceeded (for 3 valves). The highest as-left setpoint from the Ultrastar equipment was 1126 psig. Addition of the above factors provided a postulated pressure that exceeded the value assumed in the existing analysis of the Loss of External Electrical Load (LOL) event (1159 psig / 1174 psia) for three Unit 1 MSSVs. This analysis uses an older LOFTRAN MSSV model in which only a single MSSV lift pressure of 1174 psia is assumed. The deviation from the accident analysis of record was the basis for reporting the condition under 10 CFR 50.72 and 10 CFR 50.73.

In assessing system operability with an elevated lift setpoint, we discovered that the recently-approved Unit 2 LOL analysis provided a higher acceptable value of peak main steam pressure that accommodates the aforementioned inaccuracies. This Unit 2 analysis was specifically conducted to support the Point Beach Delta-47 replacement steam generator program. This new analysis uses the latest LOFTRAN MSSV model which more accurately represents the staggered lift pressures of MSSVs. In addition, the new LOL analysis includes allowances in the lift pressure of 3% to account for setpoint tolerance, 1.1% to account for valve accumulation, and 20 psi to account for the frictional differential pressure from the steam generator shell to the MSSVs under full-flow conditions. This new analysis provides acceptable results if the full-open steam generator pressure is limited to 1206.7 psia.

This new analysis methodology was applied to Unit 1 and acceptable results were achieved. Using all the aforementioned inaccuracies, our evaluation concluded that each PBNP MSSV would lift and achieve a full-open position such that the analyzed steam generator pressure would not be exceeded. Using a linear extrapolation of the empirically-derived temperature effect data, it was demonstrated that the MSSV would adequately lift for any expected ambient temperature (down to approximately -50°F).

The original LOL analysis did not explicitly address the factors that could affect MSSV lift setpoints. The original peak main steam pressure in that analysis was based on the MSSV lifting at its nominal setpoint (1125 psig) plus the nominal allowance for accumulation (3% or 34 psi). This analysis did not explicitly consider the code tolerance in the as-left setting (+/-1%), nor did it explicitly consider the code allowance for test equipment inaccuracy (+2%/-1%). If these tolerances alone are added to the nominal setpoint, the peak pressure is reached (+3%) in the original LOL analysis. Under that original analysis, any post-maintenance as-left lift setting above the nominal value, or any testing inaccuracy (causing an actual lift setting above normal) would result in exceeding the analyzed peak pressure when the nominal 3% accumulation was considered. In addition, the original analysis provided no margin explicitly for temperature effects, or the head loss caused by steam velocities in the steam lines.



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The IEEE Standard 803A-1983 component identifiers for this report are:

Steam Generator (SG)  
Relief Valve (RV)

**Component and System Description:**

The Main Steam Safety Valves (MSSV) protect the steam generators from overpressurization; preventing steam generator pressure from exceeding 110% of design pressure (110% of 1085 psig is 1194 psig). This is accomplished with four self-actuated valves per steam generator that are located on a 30-inch branch line from the associated main steam header upstream of the Main Steam Isolation Valve. The safety valves are designed in accordance with ASME Section III. The four valves per steam generator are set to relieve at 1085, 1100, 1125, and 1125 psig, respectively. The staggered settings minimize the effects of simultaneously opening and closing the valve on the protected system. The eight MSSVs per unit have a combined rated capability of 6,664,000 lbs/hr. The total full power steam flow is 6,620,000 lbs/hr; therefore eight (8) MSSVs will be able to relieve the total full-power steam flow if necessary. These valves are manufactured by Crosby (Model HA65W).

The MSSVs are located outside containment in the environment of the vented facade which experiences ambient temperatures that are generally between 11°F and 75°F. The valves are set to lift within of their nominal setpoint.

An "assist-lift" device called the Ultrastar equipment is used for testing several MSSVs in place during each refueling outage. This in situ testing was initiated in 1995 to preclude the removal of MSSVs and shipping them to an offsite laboratory.

**Corrective Actions:**

1. The Unit 1 and Unit 2 LOL events have been recently analyzed using the approved Westinghouse methodology. These analyses demonstrated that the existing MSSV setpoints were adequate to achieve design basis requirements. This new analysis method will be formally incorporated into the FSAR accident analysis.
2. All of the Unit 2 MSSVs that were previously set using the Ultrastar equipment (2 total) were sent to the laboratory, tested, and reset using boiler test equipment to eliminate the Ultrastar test bias.
3. Prior to the next performance of in situ MSSV testing (TS-44 or TS-45), the test acceptance criterion will be revised as necessary to reflect any equipment bias.

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4. With respect to the finding that the inservice testing (IST) acceptance criteria may not accommodate the design basis requirements, several IST program reviews have been initiated. These reviews have verified that pump IST acceptance criteria conform to the design basis and they have verified that valve stroke time requirements conform to the design basis. The acceptance criteria for all the IST safety and relief valves will be reviewed to verify that design basis requirements and accident analysis assumptions are accommodated.

**Cause:**

The original LOL analysis provided inadequate margin to accommodate normally expected variations in MSSV lift setpoints. The original peak main steam pressure in the analysis was based on the MSSV lifting at its nominal setpoint (1125 psig) plus the nominal allowance for accumulation (3% or 34 psi). This analysis did not explicitly consider the code tolerance in the as-left setting (+/-1%), nor did it explicitly consider the code allowance for test equipment inaccuracy (+2%/-1%). If these tolerances alone are added to the nominal setpoint, the peak pressure is reached (+3%) in the original LOL analysis. In addition, the original analysis provided no margin explicitly for temperature effects, testing inaccuracies, or head loss caused by steam velocities in the steam lines.

Conversely, the acceptance criteria established for testing of the MSSV setpoints was based on the requirements established in the ASME code. A review to assure that the criteria verified that the valves would meet the assumptions contained in the accident analysis was not performed.

**Reportability:**

A 4-hour prompt notification per 10 CFR 50.72(b)(2)(iii)(D) was reported to the NRC duty officer at 1835 CST on December 31, 1996. This Licensee Event Report is being submitted in accordance with the requirements of 10 CFR 50.73(a)(2)(ii)(B), "A condition that was outside the design basis of the plant."

**Safety Assessment:**

At the time of discovery, there were six (6) installed MSSVs with lift settings established with the Ultrastar equipment; four (4) were installed on Unit 1, and two (2) were installed on Unit 2. As discussed above, the new LOL analyses have shown acceptable results with the existing MSSV lift settings. Therefore, the health and safety of the public is not compromised by the present condition of PBNP Units 1 and 2. Also, the postulated peak steam generator pressures do not exceed the code requirement of 110% design pressure (110% of 1085 psig is 1194 psig).

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**Similar Occurrences:**

The following reportable event relates to MSSV setpoint accuracy:

<u>LER</u>	<u>Title</u>
266/90-002-00	Main Steam Safety Valve 1-2013 Setpoint Out of Specification