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October 5, 1992

United States Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Reference: Facility Operating License No. NPF-86, Docket No. 50-443

Subject: Licensee Operating Report (LER) 92-16-00: Main Steam Safety Valve Setpoint
Testing Failure

Gentlemen:

Enclosed please find Licensee Event Report (LER) No. 92-16-00 for Seabrook Station. This submittal documents a condition that was identified on September 4 and 5, 1992. This condition is being reported pursuant to 10 CFR 50.73(a)(2)(i) and 10 CFR 50.73(a)(2)(vii).

Very truly yours,

Ted C. Feigenbaum

TCF:ALL/act

Enclosures: NRC Forms 366, 366A

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a member of the Northeast Utilities system

A handwritten signature, possibly "J. E. ...", is written in the bottom right corner of the page.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) SEABROOK STATION										DOCKET NUMBER (2) 0 5 0 0 0 4 4 3										PAGE (3) 1 OF 0 5	
TITLE (4) MAIN STEAM SAFETY VALVE SETPOINT TESTING 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 9	0 5	9 2	9 2	0 1 6	0 0	1 0	0 5	9 2				0 5 0 0 0									
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11)																			
1		20.402(b)				20.405(c)				50.73(a)(2)(v)				73.71(b)							
POWER LEVEL (10)		20.405(a)(1)(i)				50.38(c)(1)				50.73(a)(2)(v)				73.71(a)							
6 5		20.405(a)(1)(ii)				50.38(c)(2)				X 50.73(a)(2)(v)											
		20.405(a)(1)(iii)				X 50.73(a)(2)(i)				50.73(a)(2)(v)(A)				OTHER (Specify in Abstract below and in Text, NRC Form 368A)							
		20.405(a)(1)(iv)				50.73(a)(2)(ii)				50.73(a)(2)(v)(B)											
		20.405(a)(1)(v)				50.73(a)(2)(iii)				50.73(a)(2)(v)											
LICENSEE CONTACT FOR THIS LER (12)																					
NAME										TELEPHONE NUMBER											
Mr. James M. Peschel, Regulatory Compliance Manager, ext. 3772										AREA CODE 6 0 3 4 7 4 - 9 5 2 1											
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																					
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC?	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC?	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC?							
X	S	B	R	I	V		C	1 7 1 1 0	Y												
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 Friday September 4, 1992, and on Saturday September 5, 1992, North Atlantic and contractor personnel conducted Main Steam Safety Valve (MSSV) setpoint testing as required by Technical Specification 4.0.5 and Section XI of the ASME Boiler and Pressure Vessel Code. During this testing, the plant was in MODE 1, with power levels being gradually reduced in preparation for Refueling Outage 2. The power level at the initiation of the valve testing was approximately 65% rated thermal power (RTP). At the initiation of the MSSV testing, the power range neutron flux high setpoint was set at 87% RTP to allow the Furmanite Trevitest device to be used which causes the MSSV being tested to be inoperable. The Trevitest device is capable of measuring the valve setpoint and resetting to the desired setpoint (within $\pm 1\%$ of the nominal setpoint). The initial population of MSSVs to be tested was 5, however due to test failures (as-found setpoints outside $\pm 3\%$ of the nominal setpoint) the tested population included all 20 MSSVs. The test results indicated that a total of 9 MSSVs were found to be outside of the $\pm 3\%$ acceptance criteria specified in Technical Specification 3.7.1.1. Six of the 9 MSSVs were reset to their required setpoint and retested satisfactorily. One valve did not require adjustment to achieve the $\pm 1\%$ as-left lift setpoint tolerance. The testing of the other two MSSV's were deferred when the valves did not lift using an adequate amount of force. The two MSSVs that did not open were removed and shipped to Wyle Labs for setpoint testing and adjustment. There were no adverse safety consequences associated with this event because the as-found setpoints of the MSSVs would not have precluded the ability of the MSSVs to maintain secondary system pressure below the Condition II (Events of Moderate Frequency) pressure limit (110% of design pressure) of 1305 psig for the secondary system. The root cause of this event is believed to be a metallurgical bonding between the MSSV seat and disc.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED ONS NO 3150-0104

EXPIRES 8/31/96

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SEABROOK STATION	0 5 0 0 0 4 4 3 9 2	0	1 6	0 0	0 2	OF 0 5

TEXT (If more space is required, use additional NRC Form 265A's) (17)

EVENT DESCRIPTION:

On Friday September 4, 1992, and on Saturday September 5, 1992, North Atlantic and contractor personnel conducted Main Steam Safety Valve (MSSV) setpoint testing as required by Technical Specification 4.0.5 and Section XI of the ASME Boiler and Pressure Vessel Code. During this testing, the plant was in MODE 1, with power levels being gradually reduced in preparation for Refueling Outage 2. The power level at the initiation of the valve testing was approximately 65% rated thermal power (RTP). When operating with the power range neutron flux high setpoint between 66% RTP and 87% RTP, Technical Specification 3.7.1.1 allows a maximum of 1 MSSV per steam generator to be inoperable. When operating with the power range neutron flux high setpoint between 44% and 65% RTP, Technical Specification 3.7.1.1 allows a maximum of 2 MSSVs per steam generator to be inoperable. When operating with the power range neutron flux high setpoint at or below 43% RTP, Technical Specification 3.7.1.1 allows a maximum of 3 MSSVs per steam generator to be inoperable. At the initiation of the MSSV testing, the power range neutron flux high setpoint was set at 87% RTP to allow the Furmanite Trevitest device to be used which causes the MSSV being tested to be inoperable. The Trevitest device is capable of measuring the valve setpoint and resetting to the desired setpoint (within $\pm 1\%$ of the nominal setpoint). The Trevitest device has been proven at many sites throughout the world. The initial population of MSSVs to be tested was 5, however due to test failures (as-found setpoints outside $\pm 3\%$ of the nominal setpoint) the tested population included all 20 MSSVs. The test results indicated that a total of 9 MSSVs were found to be outside of the $\pm 3\%$ acceptance criteria specified in Technical Specification 3.7.1.1. Six of the 9 MSSVs were reset to their required setpoint and retested satisfactorily. One valve did not require adjustment to achieve the $\pm 1\%$ as-left lift setpoint tolerance. The testing of the other two MSSV's were deferred when the valves did not lift using an adequate amount of force. This conservative action was taken to preclude a stuck open MSSV in the event the valves were malfunctioning. To accommodate testing of the other MSSVs in the two loops with an inoperable MSSV, the power range neutron flux high setpoint was reduced to 65% RTP to allow 2 MSSVs in the loop to be inoperable (the stuck MSSV and the MSSV being tested). The as-found setpoint for 7 MSSV was greater than the upper limit of $+3\%$ of their nominal setpoint. In all 7 cases however, the as-found setpoint was less than 1300 psig which is less than the Condition II (Events of Moderate Frequency) pressure limit (110% of design pressure) of 1305 psig for the secondary system. The two MSSVs that did not open were removed and shipped to Wyle Labs for setpoint testing and adjustment. One valve was tested outside the $\pm 3\%$ acceptance criteria and was reset to within $\pm 1\%$ of the lift setpoint. The other valve tested within the $\pm 3\%$ acceptance criteria and on subsequent tests lifted within $\pm 1\%$ therefore no reset was necessary.

This event is reportable pursuant to 10CFR50.73(a)(2)(i)(B) as a "condition or operation prohibited by the plant's Technical Specifications" and 10CFR50.73(a)(2)(vii)(D) "An event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single system designed to ... mitigate the consequences of an accident." The reportability of this event is discussed below.

The setpoint deviation experienced by the 9 MSSVs causing them to be outside of their required setpoint range occurred at an indeterminate time during Cycle 2. This conclusion is supported by the engineering judgement of the North Atlantic test

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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engineers. Because setpoint testing is conducted at the end of the operating cycle, it is not known at what point during the cycle the setpoint departed from the required range. The Seabrook Station Technical Specifications require the power range neutron flux high setpoint to be reduced to less than or equal to 87% RTP with one MSSV per steam generator inoperable and less than or equal to 65% RTP with two MSSVs per steam generator inoperable.

Each steam generator loop has 5 MSSVs with setpoints of 1185 psig, 1203 psig, 1220 psig, 1238 psig, and 1255 psig. The 4 MSSVs at each setpoint are called a "Group", therefore there are 4 Group 1 MSSVs, 4 Group 2 MSSVs, 4 Group 3 MSSVs, 4 Group 4 MSSVs, and 4 Group 5 MSSVs. If the 20 MSSVs are viewed as a single system and each group is viewed as a channel, at least one MSSV in each group was inoperable at the as-found setpoint. Additionally, if the 20 MSSVs are viewed as a single system and each steam generator loop is viewed as a channel, at least one MSSV in each steam generator loop was inoperable at the as-found setpoint.

The as-found and as-left lift setpoint data for the 20 MSSVs is as follows:

<u>WEST PIPE CHASE</u>	<u>SETPOINT</u>	<u>AS-FOUND</u>	<u>SETPOINT Δ</u>	<u>AS-LEFT</u>
MS-V6	1185	1226	3.46	1186
MS-V7	1203	1235	2.66	1201
MS-V8	1220	1252	2.62	1217
MS-V9	1238	1246	0.64	1246
MS-V10	1255	1279	1.91	1261
MS-V50	1185	1174	-0.93	1185
MS-V51	1203	1214	0.91	1197
MS-V52	1220	1268	3.93	1223
MS-V53	1238	1268	2.42	1245
MS-V54	1255	1263	0.64	1261

<u>EAST PIPE CHASE</u>	<u>SETPOINT</u>	<u>AS-FOUND</u>	<u>SETPOINT Δ</u>	<u>AS-LEFT</u>
MS-V22	1185	1236	4.3	1190
MS-V23	1203	1219*	1.33	1212
MS-V24	1220	1292	5.90	1216
MS-V25	1238	1268	2.42	1245
MS-V26	1255	1268	1.03	1263
MS-V36	1185	1266	6.83	1181
MS-V37	1203	1258*	4.57	1196
MS-V38	1220	1218	-0.16	1219
MS-V39	1238	1285	3.79	1247
MS-V40	1255	1298	3.42	1264

* Test results from Wyle Laboratories

SAFETY CONSEQUENCES:

There were no adverse safety consequences associated with this event. The Updated Final Safety Analysis Report (UFSAR) states that the total capacity of the 20 MSSVs exceeds 110 percent of full load steam flow at a pressure not exceeding 110 percent of the steam generator shell side design pressure (1305 psig). Yankee Atomic has

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U.S. NUCLEAR REGULATORY COMMISSION

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verified that the as-found MSSV lift setpoints would not have resulted in secondary system pressures exceeding the Condition II (Events of Moderate Frequency) pressure limit (110% of design pressure) of 1305 psig for the secondary system during the turbine trip event. The turbine trip event is the limiting UFSAR pressurization event. This verification was performed by Yankee Atomic using the same analytical methodology previously utilized in support of the license amendment approved by the NRC on, September 3, 1992, which changed the MSSV and Pressurizer Safety Valve Tolerance to $\pm 3\%$.

ROOT CAUSE:

A detailed review of all of the lift setpoint data reveals further information with regard to the physical status of the MSSVs. Of the seven MSSVs that tested outside the as-found lift setpoint tolerance, only two valves tested outside this range on subsequent tests. The other five MSSV's were all within 1.6% of the setpoint before any adjustments were performed on subsequent tests.

The MSSV that tested high outside the $\pm 3\%$ tolerance at Wyle Labs also tested within the as-found lift setpoint tolerance on subsequent tests.

This scenario where the as-found setpoint is out of tolerance high and subsequent tests are within the lift setpoint tolerance is very common throughout industries that use safety valves. There are several theories that attempt to address this, including a metallurgical bonding of the disc and seat and the thermal effects of the temperature gradient across the valve seat, disc and spring. Discussions with other utility engineers confirm that very often the as-found lift setpoint data is out of tolerance high with subsequent tests in tolerance. This issue was discussed with the valve manufacturer, Crosby Valve and Gage Company, Furmanite, and Wyle Laboratories and all agree the phenomena is inherent in the operation of safety valves.

The theory that suggests that a metallurgical bonding is occurring between the seat and disc is more credible for several reasons. In the past, the MSSV's and Pressurizer Safety Valves (PSV's) have been sent to Wyle Labs for lift setpoint testing. The valves are tested in a controlled environment similar to the pipe chases and pressurizer cubicle, respectively. With similar thermal gradients on the valves tested at Wyle, these valves have never tested outside of $\pm 3\%$. When the valves are removed from service, they are packaged and shipped to Wyle. The removal, packaging and shipping most likely disrupts any bonding that has occurred between the seat and disc, yielding more representative results of as-found lift setpoints without bonding. This is further demonstrated by the fact that the valves always leak after shipment from Wyle.

A review of previous tests for the two MSSV's that tested outside of their tolerance high on two consecutive tests, revealed adjustments that increased the setpoint by 25 and 35 psig. These valves may have been previously set "heavy", resulting in high lift setpoints.

CORRECTIVE ACTIONS:

Six of the 9 MSSVs which were outside of their required setpoint range were reset to their required setpoint and retested satisfactorily at Seabrook Station using the Trevitest device. One valve did not require adjustment to achieve the $\pm 1\%$ as-left

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FACILITY NAME (1) SEABROOK STATION	DOCKET NUMBER (2) 0500044392	LER NUMBER (8)			PAGE (3)		
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TEXT (If more space is required, use additional NRC Form 286A's) (17)

lift setpoint tolerance. The two MSSVs that did not open were removed and shipped to Wyle Labs for setpoint testing and adjustment.

North Atlantic test engineers will review Wyle and Furmanite test methodologies to ensure consistency between all possible test methods. The expected completion date for this review is December 31, 1992.

North Atlantic test engineers will participate in industry initiatives addressing MSSVs and Pressurizer Safety Valves during the period prior to the third refueling outage.

PLANT CONDITIONS:

During the MSSV setpoint testing, the plant was in MODE 1, with power levels being gradually reduced in preparation for Refueling Outage 2. The power level at the initiation of the valve testing was approximately 65% rated thermal power (RTP).

PREVIOUS OCCURRENCES:

North Atlantic previously reported on June 29, 1992, in LER 92-05, an event involving two Pressurizer Code Safety Valves which were determined to have as-found setpoints outside of the required setpoint range.