

# New Hampshire Yankee

Ted C. Feigenbaum  
President and  
Chief Executive Officer

NYN-91086

May 23, 1991

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

Attention: Document Control Desk

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

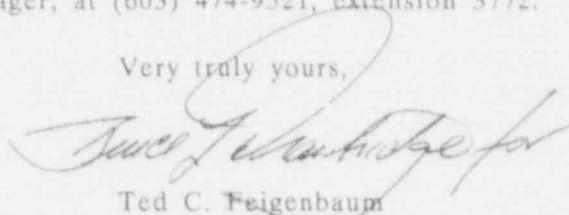
Subject: Licensee Event Report (LER) No. 91-004-00: Feedwater Check Valve Bolting Failures

Gentlemen:

Enclosed please find Licensee Event Report (LER) No. 91-004-00 for Seabrook Station. This submittal documents an event at Seabrook Station which was discovered on April 1, 1991 involving a feedwater header check valve. The valve is an angled body, controlled closure design, manufactured by Rockwell Corporation (currently Edward Valves Inc.). Edward Valves Inc. notified the NRC on April 23, 1991 of a potential safety hazard as defined in 10CFR Part 21. New Hampshire Yankee discussed the valve failure with the NRC Events Analysis Branch on April 24, 1991. This LER is being submitted pursuant to 10CFR 50.73(a)(2)(vii)(D).

Should you require further information regarding this matter, please contact Mr. James M. Peschel, Regulatory Compliance Manager, at (603) 474-9521, extension 3772.

Very truly yours,



Ted C. Feigenbaum

Enclosures: NRC Forms 366, 366A

TCF:ALL/ssl

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## 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 6									
TITLE (4) Feedwater Check Valve Bolting Failures																							
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	4	0	1	9	1	9	1	0	0	4	0	0	0	5	2	3	9	1	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)																					
2		20.402(b)				20.405(a)				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)									
2		20.405(a)(1)(ii)				50.36(c)(2)				50.73(a)(2)(vi)				OTHER (Specify in Abstract below and in Text, NRC Form 36.4A)									
		20.405(a)(1)(iii)				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)(ix)													
LICENSEE CONTACT FOR THIS LER (12)																							
NAME James M. Peschel, Regulatory Compliance Manager - Extention 3772										TELEPHONE NUMBER 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	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC				
R	S	I	V	I	F	1	0	9	1	5	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 April 1, 1991, during a plant restart, following a March 30, 1991 reactor trip, flow through the feedwater header check valve 1-FW-V330 to the A steam generator indicated that the valve was not opening properly. Efforts were made to exercise the valve by varying feedwater flow rates, but the valve did not change position.

Upon disassembly of the subject check valve, it was discovered that seven of the dash plate capscrews were broken and the eighth capscrew was stretched. This resulted in the valve disk becoming jammed in a near closed position. Subsequently, the other three feedwater header check valves were disassembled and similar capscrew failures were identified. As a result of these capscrew failures, Edward Valves, Inc. notified the USNRC, pursuant to 10 CFR 21.

The dash plate capscrews failed due to a differential pressure across the dash plate. The resultant dash plate differential forces created higher than expected tensile loads on the capscrews. The capscrews ultimately failed due to this loading. Valve design modifications were implemented to modify the dash plate and locking ring. These modifications increased the number of capscrews from 8 to 16 and machined the dash plate surface that faces the valve disk in two of the valves. By increasing the number of capscrews the individual capscrew loading will be reduced, preventing future capscrew failures. Additionally, dash plate machining was performed on two valves to prevent the valve disk from contacting the dash plate when the valve fully opens.

This is the first event of this type at Seabrook Station.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Seabrook Station	0500044391	—	004	—	00	012 OF 016

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

Description of Event

On April 1, 1991, during a plant restart, following a March 30, 1991 reactor trip, flow through the feedwater header check valve 1-FW-V330 to the A steam generator indicated that the valve was not opening properly. Efforts were made to exercise the valve by varying feedwater flow rates, but the valve did not change position.

The feedwater header check valves are an angled body, controlled closure design, manufactured by Rockwell Corporation (currently Edward Valves Inc.). The valve disk (globe valve design) is attached to an upper body piston that controls the valve closure rate to prevent feedwater system water hammer on loss of feedwater flow. The valve disk and piston are connected by a stem, which passes through a dash plate. This dash plate provides a barrier between the disk and the piston and provides a dash pot effect during valve closure. The dash plate is fixed to a retaining ring which is recessed into the valve body. Eight capscrews and a locking ring clamp the dash plate to the retaining ring. (See the figure on pages 5 and 6).

Subsequent disassembly of 1-FW-V330 revealed that seven of the eight dash plate capscrews were broken and the eighth capscrew was stretched. This configuration allowed the disk piston to become jammed in a near closed position. Further disassembly of the other three feedwater header check valves, 1-FW-V331, 1-FW-V332 and 1-FW-V333, revealed additional broken and stretched capscrews. Valve 1-FW-V331 exhibited no damage, 1-FW-V332 had five broken and three stretched capscrews and 1-FW-V333 had four stretched capscrews. The feedwater header check valves are ANSI Safety Class 2, ASME III Class 2 check valves located in each feedwater line to the steam generators.

The USNRC was notified by Edward Valves Inc. on April 23, 1991, that a safety hazard as defined by 10CFR21 may exist. NHY representatives discussed the feedwater check valve capscrew failures with USNRC Events Assessment Branch personnel on April 24, 1991. The NHY Engineering Evaluation was completed on May 14, 1991.

Safety Consequences

The feedwater header check valves (FWCV) together with the Feedwater Isolation Valves (FWIVs) and Feedwater Regulating Valves (FWRVs), are assumed to afford plant protection for a postulated Loss of Normal Feedwater event (ANS Condition II event) and a postulated Main Steam piping failure event (ANS Condition IV event). Only the FWCVs and FWIVs are assumed to provide plant protection for a postulated Feedwater System piping failure event (ANS Condition IV event). No credit is taken for the FWRVs during a feedwater line break.

In the feedwater pipebreak analysis the feedwater check valves are assumed to close to limit inventory loss from the intact steam generators and to maintain the makeup flow capability of the Emergency Feedwater System. Postulating a failure of all four FWCVs to close would allow blowdown from the intact steam generators to a postulated ruptured feed header for greater than the 10 seconds assumed in the Feedwater Line Break Analysis. This increased blowdown would significantly increase the inventory lost from the steam generators and thus reduce the effectiveness of the steam generators as a heat sink.



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104  
EXPIRES 6/31/88

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (8)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Seabrook Station	0500044391	004	000	3 OF 6	

TEXT (If more space is required, use additional NRC Form 365A-1 (1/71))

The Emergency Feedwater (EFW) System supplies makeup to each steam generator via the main feedwater header upon a loss, or isolation, of normal feed. The EFW system is assumed to supply a total of at least 470 GPM to two unaffected steam generators, including allowance for possible spillage through the main feedwater line break. The EFW design minimizes this spillage by automatic isolation of emergency feedwater to the faulted feed line. The EFW connection to the feedwater header is downstream of the FWIV. The FWCVs are required to prevent reverse flow through the feedwater system, away from the steam generators, in the event of a decrease in feedwater system pressure. For a major feedwater line rupture between the check valve and the steam generator, the ability to remove heat generated by the core from the RCS is reduced.

If the failure of a number of capscrews is postulated, this condition could prevent the closure of the FWCV, and thus, disable its safety function. As with the reported stem to dash plate seizure on the opening stroke, without these capscrews intact, the close tolerance alignment of the dash plate, relative to the stem, will not be maintained and therefore the disk piston may become jammed. Thus no credit could then be taken for the FWCVs to close due to the common occurrence of these failures.

During a postulated major feedwater line rupture accident, along with the postulated capscrew failures described above, and with a postulated single active failure of one FWIV failing to close on an unfaulted loop, unanticipated EFW spillage could occur from the unisolated header. Additionally, EFW automatic isolation to this loop will be blocked due to a previously received high flow isolation signal(s) on the faulted loop. It should be noted that no credit is taken in the analysis for the autoclosure of the FWRVs and their bypass valves. Since the EFW system design is based upon isolation of flow to a faulted feedwater line, the ability of the EFW system to mitigate the consequence of design basis accidents may be reduced.

Root Cause

The dash plate capscrews (3/8" x 2", ASTM A-193, Gr. B7) failed due to a differential pressure across the dash plate. The resultant dash plate differential forces created higher than expected tensile loads on the capscrews. The capscrews ultimately failed due to this loading.

Corrective Actions

On-site vendor support was obtained from Edward Valves Inc. and valve 1-FW-V330 was disassembled on April 2, 1991. Initial inspections found binding between the valve stem and dash plate, and seven broken capscrews and one stretched capscrew. The valve internals were completely removed and inspected to determine the cause of the capscrew failure and valve binding. As the result of finding the internal damage to the dash plate capscrews on 1-FW-V330 the remaining three feedwater header check valves were disassembled and inspected. These inspections revealed broken and stretched dash plate capscrews as stated above. No evidence of dash-plate-to-stem interference was found in these three valves.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 365A 2/157)

Valve design modifications were implemented to modify the dash plate and locking ring. These modifications increased the number of hold down capscrews from 8 to 16 and machined the dash plate surface that faces the valve disk on valves 1-FW-V330 and 1-FW-V331. By increasing the number of capscrews the individual capscrow loading will be reduced, preventing future capscrow failures. Additionally, dash plate machining was performed to prevent the valve disk from coming in contact with the dash plate when the valve fully opens. The remaining two valves, 1-FW-V332 and 1-FW-V333, did not require machining because the tolerances were such that no contact would occur between the disk and the dash plate.

Plant Conditions

At the time of this event, the plant was in MODE 2 starting up from a March 30, 1991 reactor trip. The plant was placed in MODE 3, Hot Standby, during the time that the feedwater header check valve modifications were being implemented.

This is the first event of this type at Seabrook Station.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104  
EXPIRES 8/31/88

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	

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

