



Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
Vermont Yankee
322 Governor Hunt Rd.
P.O. Box 157
Vernon, VT 05354
Tel 802-257-7711

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BVY 02-101

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Vermont Yankee Nuclear Power Station
License No. DPR-28 (Docket No. 50-271)
Reportable Occurrence No. LER 2002-003

As defined by 10CFR50.73, we are reporting the attached Reportable Occurrence as LER 2002-003, Rev. 0.

Sincerely,

ENERGY NUCLEAR OPERATIONS, INC.
VERMONT YANKEE

A handwritten signature in cursive script that reads "Kevin H. Bronson".

Kevin H. Bronson
General Manager

cc: USNRC Region I Administrator
USNRC Resident Inspector - VYNPS
USNRC Project Manager - VYNPS
Vermont Department of Public Service

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LICENSEE EVENT REPORT (LER)

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VERMONT YANKEE NUCLEAR POWER STATION (VY)	05000271	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 5
		2002	-- 003	-- 00	

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

DESCRIPTION:

Between 11/04/02 and 11/06/02 with the plant at full power, quarterly IST surveillance of the Reactor Building to Torus Vacuum Breakers (EIS = BF-VACB) was performed. These vacuum breakers (V16-19-12A & B) are 20 inch Walworth swing check valves, each capable of separately providing 100% vacuum relief to prevent the primary containment from exceeding the external design pressure. The purpose of this surveillance is to insure that the vacuum breakers will open within the IST acceptance criteria force which is applied to the center of the valve disk. Both valves required higher than typical force to lift from their seats during IST. Valve V16-19-12B failed IST requirements by lifting at 0.39 psid, but did not exceed the Technical Specifications limit of 0.5 psid. Valve V16-19-12A was measured to lift slightly above the Technical Specification limit at 0.52 psid. However, this 0.02 psid increase in lifting force would not have exceeded the Design Basis lift pressure of 2.0 psid required to meet the Torus Design Basis limit. The higher forces required to move both valves off of their seats were subsequent to pressurization of the valves to 44 psig for Appendix "J", Type C LLRT, performed after seat replacement during the previous refueling outage. When considering an actual design basis accident the postulated peak Torus accident pressure for Vermont Yankee is approximately 27 psig. The Vermont Yankee Design Basis Document for the vacuum breakers states; "The two Reactor Building-to-Torus Vacuum Relief Valve Assemblies shall automatically function to limit the Torus internal pressure within the maximum negative pressure of minus (-) 2.0 psig during normal operation and following accidents." Therefore, both vacuum breakers were capable of performing their designed safety functions at all times.

ANALYSIS:

V16-19-12A

On November 4, 2002 at 1000, V16-19-12A failed to lift off its seat within the IST acceptance criteria. The valve was declared inoperable and a seven-day Limited Condition of Operation was entered. On November 5, 2002, the valve opened when a force approximately equal to a differential pressure of 0.52 psid was applied that was slightly above the Technical Specification limit of 0.5 psid. However, this 0.02 psid increase in lifting force would not have exceeded the Design Basis lift pressure of 2.0 psid required to meet the Torus Design Basis limit. A visual inspection was immediately performed on the valve seating surfaces. No foreign material was identified that could be a cause of the valve sticking. The valve was subsequently stroked five times and determined to be within the IST acceptance criteria. Following these tests, the valve was pressurized to 27 psig in the closed direction to simulate the peak Torus accident pressure postulated for Vermont Yankee. After a ten minute hold time, the valve was depressurized and the break away force of the valve was measured again. This test was completed three times. After each test, the initial break away test was higher than the historical IST acceptance range, but less than the Technical Specification limit. Subsequent breakaway tests were all within the IST acceptance range.

Based upon valve testing, engineering reviews and assessment V16-19-12A was declared operable. On November 5, 2002 at approximately 2220. A short time after declaring V16-19-12A operable, testing commenced on the V16-19-12B valve to investigate and determine the extent of the condition.

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

V16-19-12B

On November 6, 2002 V16-19-12B failed to lift off of its seat within the IST acceptance criteria. The valve was declared inoperable and a seven-day Limited Condition of Operation was entered. A lifting force equivalent to 0.39 psid was necessary to open the valve. This is above the IST acceptance criteria, but below the Technical Specification requirement of 0.5 psid and Design Basis limit of minus (-) 2.0 psig vacuum in the Torus. After the valve was initially broken off of its seat, three subsequent breakaway force tests were performed and the results were all within normal IST range. An additional test was performed to determine if pressurization would cause the valve to have high breakaway forces. The valve was pressurized to 27 psig in the closed direction to simulate the peak Torus accident pressure postulated for Vermont Yankee for 10 minutes. After depressurization the subsequent breakaway force test showed a slightly elevated reading, but was still well within the IST range. The valve was subjected to four more breakaway force tests that were all in the normal IST range.

The highest initial breakaway force measured for either valve after the 27 psig pressurization tests were always less than the Technical Specification requirement of 0.5 psid differential pressure across the valve. The first breakaway test, following pressurization demonstrated the ability to relieve a vacuum in the Torus, and the successive breakaway tests demonstrated repeatable valve operation consistent with previous tests.

The cause of the higher than expected breakaway force for both valves was determined to be similar. The initial IST surveillance that resulted in a high force to move the valves off of their seats was performed eight days after an LLRT at 44 psig was completed. This test was performed in accordance with the Appendix "J" Leak Rate Testing Program after seat replacement with an improved material designed to provide better resistance to radiation, improved seat leakage characteristics and a longer environmental qualification (EQ). The LLRT pressurization had the effect of seating the valve disc firmly against the Ethylene-Propylene-Diene-Monomer (EPDM) seat, resulting in a higher than expected breakaway force to open the valves. Subsequent IST of the valves indicated that the force required to move the disks is within the typical IST acceptance range.

Both valves' IST lifting force results would not have exceeded the Design Basis lift pressure of 2.0 psid required to meet the Torus Design Basis limit. During all configurations encountered while testing the valves, at least one valve remained fully functional with respect to the Technical Specification limit of 0.5 psid maximum opening pressure. Each valve is designed for 100% design capacity flow to protect the containment from external pressure events.

Although the vacuum breakers were initially tested to 44 psig for Appendix "J" primary containment leak rate testing, these valves would only have been subjected to a postulated peak post accident pressure of approximately 27 psig.

These events are being reported as an "Operation or Condition Prohibited by Technical Specifications" and as a "Common-cause Inoperability of Independent Trains or Channels".

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CAUSE:

The root cause has been determined to be an unanticipated material property (seating pressure induced adhesion) of the EPDM seat material used in the seat rings that were installed in RFO-23. This caused the high force that was required to move the valves off of their seats, subsequent to pressurization of the valves to 44 psig for primary containment LLRT that would not have occurred if subjected to a pressure equivalent to Vermont Yankee's peak postulated Torus accident pressure.

CORRECTIVE ACTIONS:

Immediate:

1. Testing was performed by pressurizing the vacuum breakers to 27 psig in the closed direction (peak postulated Torus accident pressure for Vermont Yankee), and then performing the lift test. All tests subsequent to the initial pressurization that occurred after seat replacement during RFO-23, were satisfactorily within the IST acceptance range and showed no trends.
2. An accelerated testing plan was developed and implemented to begin lift testing the vacuum breakers twice per week and gradually lengthening the testing schedule back to a quarterly surveillance to insure that no time related degradation to the new seating material exists.

Long Term:

1. Evaluate and revise procedures as necessary to require cycling the vacuum breakers after local leak rate testing prior to declaring the vacuum breakers operable. This will ensure that leak rate testing induced pressure does not prevent them from performing their required safety function.
2. Determine if additional actions, use of a silicone type bond breaking lubricant or additional testing should be performed to eliminate any long term concerns with the valves sticking.
3. This event has been entered into the Vermont Yankee Corrective Actions Program.

ASSESSMENT OF SAFETY CONSEQUENCES:

Although only one valve is necessary to provide 100% Torus design basis vacuum relief, both valves were capable of performing their design safety function. There was no increased risk to the health and safety of the public as a result of this event. In addition, no events occurred during this cycle of plant operation that would have challenged the vacuum relief function or primary containment integrity.

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ADDITIONAL INFORMATION:

There were no events identified similar to this that have occurred within the past ten years at Vermont Yankee. Similar valve seats have been used in various applications in other systems that are subjected to Type C leak rate testing each outage, and there has been no previous indications of these valves sticking shut. This event appears to be a specific application-related phenomenon that presents itself as a slight increase in the pressure required to open a check valve following pressurization.