Entergy

Entergy Nuclear Operations, Inc.
Vermont Yankee
320 Governor Hunt Rd.
Vernon, VT 05354
Tel 802 257 7711

Michael J. Colomb
Site Vice President

BVY 11-018

March 1, 2011

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Licensee Event Report 05000271/2010-002-01, Inoperability of Main Steam Safety Relief Valves due to Degraded Thread Seals
Vermont Yankee Nuclear Power Station
Docket No. 50-271
License No. DPR-28

Dear Sir or Madam:

As defined by 10 CFR 50.73(a)(2)(i)(B), we are submitting the attached supplemental Licensee Event Report, LER 05000271/2010-002-01.

There are no new regulatory commitments contained within this correspondence.

Should you have any questions concerning this letter, please contact Mr. Robert J. Wanczyk at (802) 451-3166.

Sincerely,

[MJC/JMD]

Attachment: LER 05000271/2010-002-01, Inoperability of Main Steam Safety Relief Valves due to Degraded Thread Seals

cc list: (next page)

IE22
NRR

cc: Mr. William M. Dean
Region 1 Administrator
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

Mr. James S. Kim, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

USNRC Resident Inspector
Vermont Yankee Nuclear Power Station
320 Governor Hunt Road
Vernon, VT 05354

Ms. Elizabeth Miller
Commissioner
VT Department of Public Service
112 State Street, Drawer 20
Montpelier, VT 05620-2601

NRC Form 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED BY OMB: NO. 3150-0104 EXPIRES 10/31/2013

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Vermont Yankee Nuclear Power Station	05000271	1 of 3

4. TITLE

Inoperability of Main Steam Safety Relief Valves due to Degraded Thread Seals

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	
10	25	2010	2010	-- 002 --	01	03	01	2011	FACILITY NAME N/A	DOCKET NUMBER

9. OPERATING MODE

N

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Chris Wamser, General Manager Plant Operations	(802) 257-7711

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	SB	RV	C747	Yes					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES (If Yes, complete EXPECTED SUBMISSION DATE). ☒ NO				

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

During the 2010 refueling outage, the pneumatic actuators for the four main steam safety relief valves (RV), RV-2-71-A, B, C & D, were tested and leakage was identified through the shaft to piston thread seal on three of the four RVs. This leakage, when combined with the RV accumulator leakage, caused two of the four RVs to not meet design actuation requirements and therefore be considered inoperable. Technical Specification (TS) 3.6.D requires at least three of the four RVs to be operable for overpressure protection of the Reactor Coolant System and TS 3.5.F requires all four RVs to be operable to support the Automatic Depressurization System (ADS) function of the Core Standby Cooling System. Since inoperability of two valves could constitute an operation or condition prohibited by TS, a cause analysis was performed. On October 25, 2010, based on a review of the analysis, it was determined that there was firm evidence that the condition may have existed for a period of time greater than allowed by the TS. Therefore, this event is reportable in accordance with 10CFR50.73(a)(2)(i)(B) as an operation or condition prohibited by TS. Subsequent material testing of a seal from the same batch lot determined that the apparent cause of the thread seal condition was thermal degradation. The thread seals were replaced and tested on all four RVs prior to start up from the 2010 outage with new seals and will be disassembled for inspection, modified and tested during the next refueling outage. This event did not affect the automatic function of the RVs to provide overpressure protection and due to redundancy in the RV design and available nitrogen supplies, adequate relief capacity for ADS existed at all times. Therefore, this event did not pose a threat to public health and safety.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Vermont Yankee Nuclear Power Station	05000271	2010	-- 002 --	01	2 of 3

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

Description of Event

During the 2010 refueling outage, the actuators for the four main steam (EIIS=SB) safety relief valves (EIIS=RV) RV-2-71A, B, C & D, were tested and leakage was identified through the shaft to piston thread seal on three of the four RV actuators. This leakage, when combined with the RV accumulator leakage, caused two of the four RVs to not meet design actuation requirements. The thread seals were manufactured in 2002, supplied to Vermont Yankee (VY) in new style actuators in 2008 and were in service for one operating cycle prior to the test. The thread seals in the new style actuators are made of Buna-N material, were manufactured by Parker Hannifin Corporation and dedicated for use in safety class applications by Curtiss-Wright Flow Control Corporation, Target Rock Division. Prior to the upgrade to the new style actuators, the thread seals were made from a silicon material.

Each RV is equipped with an actuator assembly that retains an adequate air supply to support post accident operation assuming a loss of the non-safety related air supply. The additional leakage from the thread seal when combined with the accumulator assembly leakage resulted in two of the four RVs being not capable of meeting design actuation requirements.

TS 3.6.D requires at least three of the four RVs to be operable for protection of the Reactor Coolant System and TS 3.5.F requires all four RVs to be operable to support the ADS function of the Core and Containment Cooling System. Since inoperability of two valves could constitute an operation or condition prohibited by TS, a material analysis was performed to assess the failure modes that contributed to the event.

On October 25, 2010, based on a review of the material analysis, it was determined that there was firm evidence that the condition may have existed for a period of time greater than allowed by the TS. Therefore this event is reportable in accordance with 10CFR50.73(a)(2)(i)(B) as an operation or condition prohibited by TS.

Cause of Event

Material testing determined that the apparent cause of the thread seal condition was thermal degradation. The change to use Buna-N material in the new style seal resulted in reduced thermal margin when considering the potential local heat transfer affects on the seal material. The use of silicone material in the original application provided more margin.

Analysis of Event

The reactor coolant system is an important barrier in the prevention of uncontrolled release of fission products. The nuclear system pressure relief system is designed to protect the reactor coolant system and reactor pressure vessel from damage due to events that result in reactor isolation and the resulting high pressure. This pressure relief system consists of four RV and three Safety Valves (SVs) that automatically actuate at set-points prescribed in plant Technical Specification section 2.2 "Reactor Coolant System." The SVs are sized to prevent exceeding the reactor pressure vessel code limit for the worst case isolation (pressurization). This event did not affect the automatic functioning of either the four RVs or the three SVs and based on this there was always adequate relief capacity to protect the reactor coolant system from pressurization events. In addition this event did not impact the primary and secondary containments that also function to limit the release of fission products to the environs. The four RVs are also used for automatic depressurization of the reactor in the event of a plant accident as described in the Updated Final Safety Analysis Report. The Automatic Depressurization System (ADS) is a backup to the High Pressure Coolant Injection System (HPCI) [EIIS= BN] to reduce reactor pressure when

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Vermont Yankee Nuclear Power Station	05000271	2010	-- 002 --	01	3 of 3

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

required to allow the low pressure injection systems to deliver water to the reactor vessel. The ADS uses the four RVs that are either manually opened from the control room or automatically actuated due to a simultaneous high drywell pressure signal and a low-low reactor water level signal after a time delay. These actuations are initiated by introducing nitrogen gas to the actuator under pressure to open a pilot valve which in turn causes the main valve to open. The nitrogen gas is introduced from an accumulator assembly which contains enough gas for two operations at 70% of containment design pressure or approximately five operations at atmospheric pressure. Thus there is 100% conservatism in the accumulator design since the accident analysis assumes one actuation. In addition, a backup safety-class nitrogen supply, as discussed in UFSAR Section 6.4.2, is available with separate pressure regulators should the accumulator gas supply be depleted due to the observed leakage and further, a non-safety class nitrogen storage tank is also available should the safety-class sources be depleted.

This event did potentially affect the ability of the RVs to perform their manual and automatic ADS function since the combined thread seal leakage and accumulator leakage impacted the ability of the RVs to satisfy design actuation requirements. However, due to the redundancy in the ADS design, the availability of the HPCI system and availability of backup nitrogen supplies, the ability to depressurize the reactor was maintained.

Based on the above there was no potential adverse impact on public health and safety.

Corrective Actions

1. VY performed an operating experience review and did not identify degradation of the thread seals to be a generic issue.
2. VY performed material testing and causal analysis.
3. VY notified the vendor (Curtis-Wright Flow Control Corporation) who performed independent material testing. The vendor has entered their corrective action program and will evaluate for reporting under 10CFR21.
4. VY rebuilt the RVs with thread seals manufactured in 2007 and satisfactorily tested the four RVs during the 2010 refueling outage.
5. VY will perform inspection and leak testing of the four RV actuators during the next refueling outage.
6. VY will replace the Buna-N thread seal material in all four RVs during the 2011 refueling outage with a material that provides more temperature margin.

Previous Similar Events

No previous similar events have been reported.