Entergy

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August 6, 2007
BVY 07-048

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

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28
Docket Number: 05000271
Reportable Occurrence Number: LER 2007-002-00

Dear Sir or Madam,

As defined by 10 CFR 50.73(a)(2)(v)(D), we are submitting the attached Licensee Event Report, LER 2007-002-00, for a Reportable Occurrence that was discovered on June 8, 2007.

There are no regulatory commitments contained within this correspondence.

Sincerely,

Ted A. Sullivan
Site Vice President
Vermont Yankee Nuclear Power Station

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

IE22

NRR

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE High Pressure Coolant Injection (HPCI) System Valve Failed to Open

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
06	08	2007	2007	- 002 -	00	08	02	2007	N/A	
									FACILITY NAME	DOCKET NUMBER
									N/A	

9. OPERATING MODE

N

10. POWER LEVEL

81

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

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

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

CONTACT NAME	TELEPHONE NUMBER *(Include Area Code)*
William F. Maguire, General Manager Plant Operations	(802) 257-7711

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
E	BQ	CKTBRK	W351	NO	N/A				

14. SUPPLEMENTAL REPORT EXPECTED

○ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ◉ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On 06/08/07 with the reactor power at 81 percent, the High Pressure Coolant Injection (HPCI) Pump Injection Isolation Valve V23-19 did not open on a manual signal from the Control Room during HPCI System surveillance testing. V23-19 is a Motor Operated Valve (MOV) powered by 125 VDC. The valve is normally closed, and opens automatically on a HPCI initiation Signal. The valve can also be operated manually using a control switch in the Control Room. The MOV power supply circuit breaker contains two sets of contactors that control valve direction. One contactor is for the open direction, and one is for the close direction. Each contactor has two sets of electrical contacts connected in series. Troubleshooting by Electrical Maintenance determined that one of the two close contacts was in the intermediate position causing electrical and mechanical interlocks to prevent the open contactor from energizing. The interlocks are part of the system design to prevent the motor from being energized in both open and close directions at the same time. The Root Cause Team identified that the Preventative Maintenance required to be performed on theV23-19 valve's motor operator control circuitry was not fully effective for the application.

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NARRATIVE

DESCRIPTION

On 06/08/07 with the reactor power at 81 percent, while testing the High Pressure Coolant Injection (HPCI) System (EIIS = BQ), the HPCI Pump Injection Isolation Valve V23-19 did not open on a manual signal from the Control Room. This event occurred at 0910. The NRC was notified at 1049 (within 8 hours) per 10 CFR 50.72(b)(3)(v)(D), NRC Event Number 43413.

HPCI Injection Isolation Valve V23-19 is a Motor Operated Valve (MOV) powered by 125 VDC. The valve is normally closed, and is opened automatically on a HPCI initiation Signal. The valve can also be operated manually using a control switch in the Control Room. When the Control Room Operator (CRO) attempted to open the valve, the control switch was placed in the open position. The close indicating light was observed not to dim as it normally does when the MOV motor energizes in the open direction. The dual Red-Green valve position indication was not received, which is an indication that the valve did not open. A repeat attempt to open V23-19 was conducted with the same result.

The Control Room Switch actuates contactors (Westinghouse, Type MMD-421, Size 4 DC), located in cubicle LOCAL-V23-19 (EIIS = CKTBRK) that close to provide power to the motor on the MOV. Two separate sets of contactors are provided to control valve direction. One contactor is for the open direction, and one is for the close direction. Each contactor has two (2) sets of electrical contacts that are electrically connected in series. An interlock prevents attempting to energize both open and close contactors at the same time. This is the part of the system design to prevent the motor from being energized in both directions at the same time. Troubleshooting by Electrical Maintenance determined that one of the two close contacts (72/C) was in the intermediate position, causing electrical and mechanical interlocks to prevent the open contactor (72/O) from energizing.

Time-line:

05/31/07: Electrical Maintenance inspected the HPCI V23-19 valve starter LOCAL-23-19 cubicle. The contactors were noted to be carbonized and pitted. This was an expected condition due to the load on these contacts during MOV operation. The contacts were cleaned and no unusual indications were observed.

06/01/07: During performance of the Emergency Core Cooling (ECCS) Test, V23-19 again stroked open satisfactorily. Following, the ECCS Test, MOV Motor Control Center (MCC)Testing was performed on V23-19. The valve was stroked again with no unusual indications. Following this testing, V23-19 was closed by Operations as part of the system line-up per station procedure.

06/08/07: Operations attempted to open V23-19 as part of normally scheduled surveillance activities for the HPCI System. V23-19 failed to open on a manually initiated signal from the Control Room. The surveillance procedure provides steps to stroke the HPCI System Valves individually. There was no effect on the plant at the time of this surveillance activity as the system had no initiation signal present at that time. The problem occurred due an internal starter interlock in the contactor not being satisfied to allow the MOV to open.

The Control Room Crew discussed the possibility that the V23-19 control switch may not have been held long enough or moved far enough in the open direction. A second attempt to open V23-19 was made. This attempt was not successful. Operations stopped the performance of the surveillance, placed the HPCI System in a safe condition, and declared the HPCI System inoperable. The Reactor Core Isolation Cooling System (RCIC), the Automatic Depressurization System (ADS), Core Spray System, and the Low Pressure Coolant Injection Systems (LPCI) were verified operable in accordance with the Technical Specifications. Plant Operators entered a 14 day Limiting Condition of Operation (LCO) for the HPCI System, notified the NRC per per 10 CFR 50.72(b)(3)(v)(D) and performed a risk assessment using ORAM-Sentinel.

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It was determined that the V23-19 Close Contactor failed at the last closure evolution performed by Operations during the valve lineup. The 72/C contacts close to power the valve motor in the shut direction. When the valve is fully closed, a torque switch removes power from the contactor relay, allowing the contactor to spring back to its normally open position. The contactor had not fully returned to the normal de-energized position because its contacts had excessively arced and were fused together. The Close Contactor does not energize during an open signal to the valve. The Close Contactor failed in a manner such that the interlock prevented the Open Contactor from actuating. This is part of the MOV design to prevent both contactors from closing at the same time.

Prior to implementing the corrective actions developed by the Root Cause Analysis Team, the contactors were inspected at 6 year intervals and replaced when signs of degradation such as pitting were present. The contactors will continue to be inspected at 6 year intervals and as a result of corrective actions created to prevent recurrence of this event, the contactors will be replaced, regardless of condition, at 18 year intervals (during the third 6 year inspection interval).

CAUSE

Root Cause:

The Root Cause Team identified that the Preventative Maintenance required to be performed on the V23-19 valve's motor operator control circuitry was not fully effective for the application. A time-based replacement of these contactors would have prevented this event. No Human Performance items for this event were identified by the Root Cause Team.

Additionally, it was determined that procedural guidance for the V23-19 control circuitry inspection requires enhancement. Specifically, the inspection procedure did not contain adequate guidance for determining contact wear.

ASSESSMENT OF SAFETY CONSEQUENCES

The HPCI system is designed to supply high pressure coolant to the reactor core, to prevent excessive fuel clad temperatures, in the event of a small-break loss of coolant accident (LOCA) that does not result in a rapid depressurization of the reactor vessel and can supply reactor makeup during periods when the Feedwater System is isolated or otherwise unavailable. The failure of V23-19 to open would have prevented the HPCI system from performing the design safety functions listed above.

During the period of HPCI system unavailability, the Reactor Core Isolation Cooling System (RCIC), the Automatic Depressurization System (ADS), Core Spray System, and the Low Pressure Coolant Injection Systems (LPCI) were verified operable as required by Technical Specification 3.5.E.2. The Technical Specification HPCI LCO period of 14 days was not exceeded from the date that the valve was successfully operated to that date when repairs were complete. Technical Specification 3.5.E.1 requires the HPCI system to be operable whenever irradiated fuel is in the vessel (RPV) and reactor steam pressure is greater than 150 psig.

An evaluation has determined that this event did not constitute a significant increase in risk. It is conservatively assumed that HPCI was out of service at the time during reactor startup when RPV pressure reached 150 psig on 06/06/07 0243, and was returned to service on 06/12/07 at 1626 following successful Preventative Maintenance Testing. The interval of time that HPCI was unavailable while RPV pressure was above 150 psig was therefore 158 hours. The Core Damage Frequency (CDF) with HPCI unavailable is 2.93E-5/Ry (Ry = Reactor Year), and the base CDF (zero-maintenance) is 3.03E-6/Ry. The Incremental Core Damage Probability (ICDP) associated with this event is 4.73E-7/Ry, which is lower than the ICDP significance threshold of 1.0E-06/Ry.

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17. NARRATIVE

CORRECTIVE ACTIONS

Immediate Actions

1) Plant Operators entered 14 day HPCI System LCO and verified that the RCIC, ADS, Core Spray, and LPCI Systems were available.

2) Notified the NRC per per 10 CFR 50.72(b)(3)(v)(D) and performed a risk assessment using ORAM-Sentinel.

3) Electrical Maintenance and Engineering commenced trouble-shooting activities, V23-19 control circuitry was repaired and the HPCI system was returned to a fully operable status.

Corrective Actions to Prevent Recurrence (CAPR)

1) A Preventative Maintenance Change Request (PMCR) was initiated and assigned to System Engineering to enhance the Preventative Maintenance Basis by increasing the frequency for the replacement of MOV Heavy Loaded DC contactors to an 18 year interval.

2) On a priority basis, replace contactors in DC MOVs with highly loaded (current) contactors that are greater than 18 years old.

3) Develop a preventative maintenance schedule, based upon contactor size and safety significance for inspection and evaluation of the condition of DC contactors.

Long Term Corrective Actions

1) Revise procedure OP-5210, "MCC Inspections", to provide criteria for determining contact wear and replacement.

ADDITIONAL INFORMATION

No similar events have occurred at VY within the past ten years.