

July 1, 2002

Mr. Michael A. Balduzzi  
Senior Vice President  
and Chief Nuclear Officer  
Vermont Yankee Nuclear Power Corporation  
185 Old Ferry Road  
P.O. Box 7002  
Brattleboro, Vermont 05302-7002

SUBJECT: VERMONT YANKEE - NRC INSPECTION REPORT 50-271/02-04

Dear Mr. Balduzzi:

On May 18, 2002, the NRC completed an inspection at your Vermont Yankee facility. The enclosed report documents the inspection findings which were discussed on June 7, 2002, with Mr. Kevin Bronson and other members of your staff.

This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the inspectors identified four issues of very low safety significance (Green), all of which were determined to involve a violation of NRC requirements. However, because of their safety significance and because the issues have been entered into your corrective action program, the NRC is treating these issues as non-cited violations, in accordance with Section VI.A.1 of the NRC's Enforcement Policy, issued May 1, 2000, (65FR25368). If you contest these NCVs, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington, D.C. 20555-001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at Vermont Yankee.

Immediately following the terrorist attacks on the World Trade Center and the Pentagon, the NRC issued an advisory recommending that nuclear power plant licensees go to the highest level of security, and all promptly did so. With continued uncertainty about the possibility of additional terrorist activities, the Nation's nuclear power plants remain at the highest level of security and the NRC continues to monitor the situation. This advisory was followed by additional advisories, and although the specific actions are not releasable to the public, they generally include increased patrols, augmented security forces and capabilities, additional security posts, heightened coordination with law enforcement and military authorities, and more limited access of personnel and vehicles to the sites. The NRC has conducted various audits of your response to these advisories and your ability to respond to terrorist attacks with the capabilities of the current design basis threat (DBT). On February 25, 2002, the NRC issued an Order to all nuclear power plant licensees, requiring them to take certain additional interim

compensatory measures to address the generalized high-level threat environment. With the issuance of the Order, we will evaluate VY's compliance with these interim requirements.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Clifford J. Anderson, Chief  
Projects Branch 5  
Division of Reactor Projects

Docket No. 50-271  
License No. DPR-28

Enclosure: Inspection Report 50-271/02-04

Attachment: Supplementary Information

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REGION I

Docket No. 50-271

Licensee No. DPR-28

Report No. 50-271/02-04

Licensee: Vermont Yankee Nuclear Power Corporation

Facility: Vermont Yankee Nuclear Power Station

Location: Vernon, Vermont

Dates: March 31 - May 18, 2002

Inspectors: Brian J. McDermott, Senior Resident Inspector  
Edward C. Knutson, Resident Inspector  
Robert J. Summers, Senior Project Engineer  
Joseph T. Furia, Senior Health Physicist  
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Approved by: Clifford J. Anderson, Chief  
Projects Branch 5  
Division of Reactor Projects

## SUMMARY OF FINDINGS

IR 05000271-02-04, on 03/31-05/18/2002; Vermont Yankee Nuclear Power Station; Vermont Yankee Nuclear Power Corporation; Maintenance Risk Assessment and Emergent Work Evaluation, Operability Evaluations, Refueling and Outage Activities, Surveillance Testing.

This inspection was performed by the resident inspectors and region-based inspectors specializing in radiation safety, plant operations, and emergency preparedness. The inspection identified four Green findings which were also determined to involve non-cited violations. The significance of a finding is indicated by its color (Green, White, Yellow, Red), as determined using Inspection Manual Chapter 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply are indicated by "No Color" or by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at <http://www.nrc.gov/reactors/operating/oversight.html> (the Public Electronic Reading Room).

### A. Inspector Identified Findings

#### **Initiating Events**

- **Green.** The inspector identified a non-cited violation of Technical Specification (TS) 6.4, "Procedures" for the failure to provide an adequate procedure for removing equipment from service. An improper valve alignment allowed water from the refueling cavity to flood the reactor core isolation cooling (RCIC) steam line during the 2002 Mid-Cycle Outage. Two valves in the RCIC steam line were unintentionally left open during a tagging activity to support filling the refueling cavity for maintenance. AP 0140, "Vermont Yankee Local Control Switching Rules," and Tagging Order 020425 did not provide sufficient controls to ensure the valves were left in the desired position. Human performance errors and poor communication were contributing factors to this event.

The failure to provide an adequate procedure for removing equipment from service was considered more than minor because it could be viewed as a precursor to a significant event. However, the inspector determined this issue was of very low safety significance (Green) because there was no actual loss of reactor coolant system inventory and the potential flowpath created by the tagging error would not cause a rapid decrease in inventory. Based on the location of the RCIC steam line, this event did not have the potential to drain the reactor vessel or cause a loss of decay heat removal. With the refueling cavity filled and fuel movements in progress, any loss of inventory through the three inch RCIC steam line (including the turbine and its exhaust check valves) would be slow and well within the capacity of the available CS and RHR pumps. (Section 1R20)

#### **Mitigating Systems**

- **Green.** A non-cited violation of TS 6.4, "Procedures," occurred when an operator failed to follow the work order for draining the high pressure coolant injection (HPCI) turbine exhaust steam drain pot. On April 24, when an operator drained the drain pot through valve HPCI-146, the operator did not perform the final step of the work order step text,

## Summary of Findings (cont'd)

which was to close HPCI-146. The improper valve alignment was identified approximately eleven hours later when a different operator drained the drain pot.

This issue was considered more than minor because the failure to follow procedures for the operation of safety-related equipment could have a credible impact on plant safety. Specifically, the failure to align the HPCI system in accordance with approved procedures could have affected the operability of the system due to increased room temperature during system operation. However, the inspectors determined this issue was of very low safety significance (Green) based on a Phase 1 evaluation of the SDP because a subsequent analysis demonstrated that operability of the HPCI system was not affected, the problem was readily identified, and the system was promptly returned to its normal standby alignment. (Section 1R13)

- **Green.** The inspector identified a non-cited violation of 10 CFR 50 Appendix B, Criterion XVI, "Corrective Action," for the failure to adequately identify and resolve an issue related to degraded cooling water flow to an RHRSW pump motor. Specifically, cooling water flow to the RHRSW subsystem "B" pump motors was degraded by microbiologically induced corrosion (MIC). Indication of this problem was first documented by operators in October 2001, however VY's actions to resolve the issue were not effective and several opportunities to identify the continuing problem were missed.

This finding was considered more than minor because the cooling water flow to the RHRSW Subsystem "B" pump motors was actually degraded. However, the inspector determined this issue was of very low safety significance (Green) based on a Phase 1 SDP evaluation. VY was able to show through evaluation that the pump motor bearings would not overheat and that the RHRSW pumps would remain operable. (Section 1R15)

- **Green.** A non-cited violation of TS 6.4, "Procedures," occurred when operators failed to follow the procedure for a core spray (CS) quarterly valve surveillance. The procedure directed that the pump control switch be returned to the "auto" position as a part of system restoration from testing, however, operators left the CS pump "B" control switch in the "pull to lock" position. Additionally, during a subsequent procedurally-directed two-party system lineup verification, operators failed to identify the discrepant condition. As a result, CS subsystem "B" was declared operable following the test when it was actually in an inoperable condition. The problem was identified three hours later during a routine control board walkdown that was performed by a different operator.

This issue was considered more than minor because the failure to follow procedures for the operation of this safety-related equipment had a credible impact on plant safety. Specifically, the failure to operate the CS system in accordance with approved procedures affected the operability of the system. However, the inspectors determined this issue was of very low safety significance (Green) based on a Phase 1 evaluation of the SDP because the problem existed for only a short period of time, was readily

## Summary of Findings (cont'd)

identified and corrected, and the system was promptly returned to its normal standby alignment (operable). (Section 1R22)

### B. Licensee Identified Findings

None.

## Report Details

### **SUMMARY OF PLANT STATUS**

Vermont Yankee (VY) operated at 91 percent power during most of the inspection period. VY had previously established a maximum steady state operating power of 91 percent in response to five fuel cladding defects that had developed since December 2001. On May 11, the plant was shut down for a mid-cycle outage to replace the fuel bundles which had developed cladding defects and other bundles that were considered potentially vulnerable to similar defects. The outage was in progress at the close of the inspection period.

#### **1. REACTOR SAFETY**

##### **Cornerstone: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness**

#### 1R04 Equipment Alignment

##### a. Inspection Scope

The inspector performed partial system walkdowns (visual inspections) to verify system alignment and to identify any discrepancies that would impact system operability. Observed plant conditions were compared with the standby alignment of equipment specified in VY's system operating procedures. In addition, the inspector referenced the general guidance in NRC Inspection Procedure 71111, Attachment 4, "Equipment Alignment." The inspectors observed valve positions, the availability of power supplies, and the general condition of selected components in the following systems:

- The high pressure coolant injection system (HPCI) and its support equipment, during scheduled maintenance on the "A" reactor feed water pump. The operability requirements for this system are listed in Technical Specification (TS) 3.5 and the system's standby alignment is defined by VY operating procedure OP 2120.
- Residual heat removal (RHR) subsystem "B" and its support equipment, during replacement of service water (SW) pump "C". The operability requirements for this system are listed in technical specification (TS) 3.5 and the system's standby alignment is defined by VY operating procedure OP 2124.

##### b. Findings

No findings of significance were identified.

#### 1R05 Fire Protection

##### a. Inspection Scope

The inspector toured plant areas important to safety in order to assess VY's control of transient combustibles and ignition sources, and the material condition and operational status of fire protection systems, equipment, and barriers. The inspector identified fire

areas important to plant risk based on the Fire Protection Program and the Individual Plant Examination of External Events (IPEEE). Additional plant areas were selected based on their increased significance due to ongoing plant maintenance. The inspection elements identified in NRC Inspection Procedure 71111, Attachment 5, "Fire Protection," were used in evaluating the following plant areas:

- On April 23, the west switchgear room due to increased risk significance during the SW pump "C" maintenance period.
- On April 23, the cable vault due to increased risk significance during the SW pump "C" maintenance period.
- On May 3, the reactor building 252' elevation south due to risk significance.
- On May 15, the feed water heater bay and condenser bay due to safety significance and inaccessibility during plant operations.

b. Findings

No findings of significance were identified.

1R12 Maintenance Rule Implementation

a. Inspection Scope

The inspector reviewed VY's implementation of the Maintenance Rule for structures, systems and components that exhibited performance problems. The inspector also reviewed a sample of risk significant systems to verify proper identification and resolution of maintenance rule-related issues. NRC Inspection Procedure 71111, Attachment 12, "Maintenance Rule Implementation," and VY Program Procedure PP 7009, "10 CFR 50.65, Maintenance Rule Program," were used as references during this inspection. VY's performance monitoring for the following systems and/or assessments of component failures were reviewed during this inspection period:

- The high pressure coolant injection system due to safety significance.
- The residual heat removal service water (RHRSW) system due to a flow restriction that was identified in the "B" loop RHRSW motor cooling supply line.

b. Findings

No findings of significance were identified.

## 1R13 Maintenance Risk Assessment and Emergent Work Evaluation

### .1 High Pressure Coolant Injection System Steam Admission Valve Seat Leakage

#### a. Inspection Scope

The normally closed HPCI steam admission valve, HPCI-14, has recently developed internal leakage. With the HPCI system in standby, the resultant condensate collects in the turbine exhaust steam drain pot and must be periodically drained. To monitor the valve's condition, VY instituted a work order to measure the amount of condensate that is drained during this operation. In this inspection, the inspector reviewed Event Report (ER) 2002-0839, where personnel performance issues were identified as a causal factor for an event in which the drain valve that is operated during this process was found to be out of its required position.

#### b. Findings

Green. A non-cited violation of TS 6.4, "Procedures," occurred when an operator failed to follow the work order for draining the HPCI turbine exhaust steam drain pot. Work Order 02-001737-000 had been initiated to quantify increased steam leakage past the normally closed steam admission valve, HPCI-14, in association with draining the turbine exhaust drain pot; prior to this condition, draining had been accomplished per alarm response procedure 3-U-6, "HPCI Turbine Exhaust Drain Pot Level High." On April 24, when an operator drained the drain pot in response to the control room annunciator, the operator did not perform the final step of the work order, which was to close HPCI-146. The improper valve alignment was identified approximately eleven hours later when a different operator drained the drain pot.

VY performed an operability evaluation of HPCI for the period that HPCI-146 had been open. HPCI-146 drains to an open floor drain in the HPCI room, so the challenge posed by the valve being open would be high room temperature during HPCI operation. VY's analysis concluded that the resultant temperature increase would not have been sufficient to actuate the HPCI steam leak detection system or to invalidate the environmental qualification of the system.

This issue was considered more than minor because the failure to follow procedures for the operation of safety-related equipment could have a credible impact on plant safety. Specifically, the failure to align the HPCI system in accordance with approved procedures could have affected the operability of the system. However, the inspectors determined this issue was of very low safety significance (Green) based on a Phase 1 evaluation of the SDP (Inspection Manual Chapter 0609) because operability of the HPCI system was not affected, the problem was readily identified, and the system was promptly returned to its normal standby alignment.

Technical Specification 6.4, "Procedures," requires that written procedures be established and implemented for corrective maintenance operations which could have an effect on the safety of the reactor. VY Work Order 02-001737-000, Revision 1, step 2.C, states, "Close HPCI-146." Contrary to the above, on April 24, the operator did not close HPCI-146 when directed by Work Order 02-001737-000. This violation is being

treated as a non-cited violation, consistent with Section VI.A.1 of the Enforcement Policy, issued May 1, 2000 (65FR25368). This issue was entered in VY's corrective action program as ER 2002-0839. **(NCV 50-271/02-04-01)**

.2 Routine Observations

a. Inspection Scope

The inspector reviewed one planned and two emergent maintenance activities based on the guidance in NRC Inspection Procedure 71111, Attachment 13, "Maintenance Risk Assessment and Emergent Work Control." VY procedures AP 0125, "Equipment Release" and AP 0172, "Work Schedule Risk Management - Online," were used as criteria to assess VY's activities.

- The planned LCO maintenance period for SW pump "C" replacement and motor overhaul during the week of April 22.
- The emergent work on the torque switch for the HPCI turbine steam admission valve's motor operator on April 9. This activity was not effective in reducing steam leakage through the valve.
- The emergent work to investigate the degraded motor cooling flow to RHRSW pump "D" on April 23. No performance problems were noted during performance of the emergent work. However, degradation of the RHRSW system was identified and this issue is addressed in Section 1R15 of this report.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations

.1 Degradation Of RHRSW Subsystem "B" Motor Cooling Flow

a. Inspection Scope

On March 13, the inspector observed that the motor cooling flow to RHRSW pump "D" decreased by 0.6 gpm as operators increased the RHRSW system flow. Although the motor cooling flow remained within the design range of 3 to 6 gpm, the inspector was concerned because VY's operating procedures use this same range. If the cooling flow was initially set at the low end of the procedure range, adjustment of the RHRSW system flow could result in inadequate motor cooling. This observation was conveyed to system engineering and plant management.

On April 14, VY performed a maintenance run of RHRSW pump "D" with auxiliary operators periodically monitoring the motor cooling flow. On several occasions the motor cooling flow decreased to 2.7 gpm and operators increased the flow to greater

than 3 gpm in accordance with OP 2124. Event Report (ER) 2002-0760 was initiated to document this problem and an operability determination was performed.

The inspector reviewed the operability determination and observed subsequent trouble shooting activities performed on April 23. NRC Inspection Procedure 71111, Attachment 15. "Operability Evaluations," and NRC Generic Letter 91-18, "Resolution of Degraded and Nonconforming Conditions," were used as guidance for this review.

The following documents were reviewed:

- Vermont Yankee Event Reports 2002-0760, 2002-0802, 2002-0803, 2002-0806, 2002-0828, 2002-0844, and 2001-2277.
- Vermont Yankee Work Order 01-004568
- Vermont Yankee Basis for Maintaining Operation, BMO 2002-06
- Vermont Yankee Operating Procedure OP 2124, "Residual Heat Removal System"

b. Findings

Green. The inspector identified a non-cited violation of 10 CFR 50 Appendix B, Criterion XVI, "Corrective Action," for the failure to adequately identify and resolve an issue related to degraded cooling water flow to an RHRSW pump motor. Cooling water flow to the RHRSW subsystem "B" pump motors was degraded by microbiologically induced corrosion (MIC). Indication of this problem was first documented by operators in October 2001, however, VY's actions to resolve the issue were not effective and several opportunities to identify the continuing problem were missed. The issue was determined to be of very low safety significance based on a Phase 1 SDP evaluation. VY's operability determination provided a reasonable basis to conclude the pumps would be able to perform their intended function with the observed degradation in cooling flow.

Each RHRSW subsystem consists of two 100 percent capacity pumps. Motor cooling water for both pumps in a subsystem is supplied by a three quarter inch cooling line that taps off an eight inch SW line in the associated SW header. The cooling flow for each pump is controlled by a pressure control valve and a solenoid valve that automatically opens to initiate cooling flow when its associated RHRSW pump is started. Pressure switches and pressure indication for the SW system are located on the RHRSW cooling branch lines.

A buildup of MIC at the carbon steel to stainless steel transition was restricting the RHRSW subsystem "B" motor cooling flow and impacting the SW Subsystem "B" pressure indication and low pressure isolation switches. During pump starts, the initiation of motor cooling flow and flow restriction caused the SW subsystem "B" header pressure indication to decrease by as much as 24 psi. During simultaneous operation of both RHRSW Subsystem B pumps, the additional cooling flow caused a momentary

pressure drop at the SW pressure switches for automatic isolation (with a 27 second time delay) of the non-safety SW loads in the turbine building.

System engineering began data collection and evaluation of RHRSW motor cooling flow in response to the inspector's questions on March 13. Problems with the pressure control valve and solenoid valve in the cooling line complicated VY's troubleshooting efforts. The flow restriction was characterized by VY after troubleshooting and data collection on April 23. The test results demonstrated that each RHRSW pump could be supplied with at least 4 gpm of cooling flow. The engineering evaluation documented in BMO 2002-06 states that 1.75 gpm of cooling flow to each pump would be sufficient under design basis conditions. The degraded portion of the RHRSW subsystem "B" line was replaced during the May 2002 Mid-Cycle Outage and test results show that RHRSW subsystem "A" does not currently have any significant cooling flow restrictions.

This finding was determined to be more than minor because the motor cooling flow for RHRSW subsystem "B" pumps was actually degraded and therefore had a credible impact on safety. However, the inspector determined this issue was of very low safety significance (Green) based on a Phase 1 SDP evaluation. BMO 2002-06 provided a reasonable basis for operability that credits conservatism in the cooling capacity calculation and considers historical data. VY's procedures require 3 gpm of cooling flow, the lowest observed flow was 2.7 gpm, and the BMO evaluation concluded that the bearings would be adequately cooled by a flow of 1.75 gpm. The cooling capacity calculation is conservative because it assumes the cooling water is at 105°F (the Alternate Cooling System deep basin design temperature) and the cooling water supplied under design basis accident conditions is 85°F. Under the Alternate Cooling System scenarios operator action is required to align the system and make any necessary adjustments to the RHRSW pump cooling flow.

The inspector considered VY's problem identification and resolution for this problem to be inadequate based on the following:

- On October 30, 2001, during the start of a second pump in RHRSW subsystem "B", operators identified an unexpected decrease in the indicated pressure for SW Subsystem "B" and an automatic isolation signal for the non-essential SW loads was momentarily initiated by the SW low pressure switch. ER 2001-2277 and work order 01-004568 were initiated. After air was discovered in the instrument line, there was no verification or test to confirm that the problem had been resolved. The ER and work order were closed.
- On January 28, 2002, a surveillance on RHRSW subsystem "B" presented an opportunity for operators to question why the SW pressure indication problem had not been resolved. No ER was initiated.
- On April 21, an automatic isolation signal for the non-essential SW loads was momentarily initiated by the SW low pressure switch (located on the RHRSW motor cooling branch line) during the start of the second pump in RHRSW subsystem "B". No ER was initiated until April 25, after the inspectors and VY management became aware of the event.

10 CFR 50 Appendix B, Criterion XVI, "Corrective Actions," requires that conditions adverse to quality are promptly identified and corrected. Vermont Yankee Administrative Procedure (AP) 0009, "Corrective Action," requires the initiation of an Event Report for degraded conditions affecting technical specification or safety class equipment. Contrary to the above, in November 2001 a problem effecting SW subsystem "B" pressure indication and low pressure isolation instrumentation was identified but not corrected. Consequently, the degraded motor cooling water supply to RHRSW subsystem "B" went undetected until the NRC began asking questions in March 2002. This failure to promptly identify and correct this condition adverse to quality is being treated as a non-cited violation, consistent with Section VI.A.1 of the Enforcement Policy, Issued May 1, 2000 (65FR25368). This issue was entered in VY's corrective action program as Event Report 2002-1393. **(NCV 50-271/02-04-02)**

.2 Routine Observations

a. Inspection Scope

The inspector reviewed a sample of operability determinations prepared by VY using the guidance in NRC Generic Letter 91-18 for evaluation of degraded or non-conforming conditions. The following plant issues were reviewed:

- ER 2002-0815, concerning a pinhole leak on the service water supply to the lube oil cooler for emergency diesel generator "A".
- ER 2002-0839, concerning a drain valve on the HPCI turbine exhaust drain pot that was left open with the system in its normal (operable) stand by alignment.
- ER 2002-1113, concerning an unexpected response from source range monitor (SRM) "B" during a daily surveillance in support of fuel movement.

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing

a. Inspection Scope

The inspector reviewed documentation and/or observed portions of the post maintenance testing associated with online maintenance. The review was performed using the guidance provided in NRC Inspection Procedure 71111, Attachment 19, "Post-Maintenance Testing." VY operating procedures, work documents and TS requirements were used as criteria, when applicable, for this inspection.

The following post-maintenance testing activity was evaluated:

- On April 25, the service water pump "C" capacity test following replacement of the pump and maintenance of the motor.

b. Findings

No findings of significance were identified.

1R20 Refueling and Outage Activities

.1 Tagging Problem Results In Flooding of RCIC Steam Line

a. Inspection Scope

On May 13, operators implemented Tagging Order 020425 to close various steam line valves in support of filling the refueling cavity with water for fuel movement. As part of this tagging order the reactor core isolation cooling (RCIC) steam supply isolation valves, RCIC-15 and RCIC-16, were to be closed and de-energized. On May 20, operators clearing Tagging Order 020425 discovered that RCIC-15 and RCIC-16 were open and de-energized. With the steam supply isolation valves open, the water used to fill the refueling cavity flooded the RCIC steam line down to the steam admission valve, RCIC-131, located on lowest elevation of the reactor building.

Between May 13 and May 20, the potential existed for someone to open the RCIC-131 valve. Because of the tagging error, opening the motor-operated RCIC-131 would have created a drain path from the refueling cavity to the torus, through the RCIC turbine and its exhaust line.

The inspector reviewed this event using the guidance contained in NRC Inspection Procedure 71111, Attachment 20, "Refueling and Other Outage Activities" and Inspection Procedure 71152, "Identification and Resolution of Problems."

The following documents were reviewed:

- Vermont Yankee Event Report 2002-1193, dated May 20, 2002
- Switching and Tagging Order 02425
- Vermont Yankee Administrative Procedure, AP 0140, "Vermont Yankee Local Control Switching Rules"

b. Findings

Green. The inspector identified a non-cited violation of TS 6.4, "Procedures" for the failure to provide an adequate procedure for removing equipment from service. An improper valve alignment allowed water from the refueling cavity to flood the RCIC steam line during the 2002 Mid-Cycle Outage. Two valves in the RCIC steam line were unintentionally left open during a tagging activity to support filling the refueling cavity for maintenance. AP 0140, "Vermont Yankee Local Control Switching Rules," and Tagging Order 020425 did not provide sufficient controls to ensure the valves were left in the desired position. Human performance errors and poor communication were contributing factors to this event.

AP 0140 allows operators to verify the position of a closed motor-operated valve (MOV) by use of local position indication and/or remote indicating lights. The procedure also prohibits the use of an MOV handwheel without specific direction from the control room. The breakers for RCIC-15 and RCIC-16 were tagged open on one shift and their handwheels were tagged by the next shift. The procedural control (tagging order process) did not provide adequate assurance the MOVs were left in the closed position, communication between the two shifts was not adequate, and personnel implementing the tagging order made assumptions regarding what had taken place on the previous shift.

Tagging orders for MOVs at VY have typically required tagging of the valve's electrical supply breaker and the valve's handwheel. The expectation was that communication between the operators in the field and the control authority would ensure valves were in the desired position, prior to opening the supply breaker. However, this expectation was not proceduralized and on May 13 the process broke down when the activity was implemented over two shifts.

This finding is more than minor because the failure to provide an adequate process for removing equipment from service could be a precursor to a more significant event. However, in this case the inspector determined this finding was of very low safety significance (Green) based on an SDP Appendix G evaluation. There was no actual loss of reactor coolant system inventory and the potential flowpath created by the tagging error would not cause a rapid decrease in inventory. Based on the location of the RCIC steam line, this event did not have the potential to drain the reactor vessel or cause a loss of decay heat removal. With the refueling cavity filled and fuel movements in progress, any loss of inventory through the three inch RCIC steam line (including the turbine and its exhaust check valves) would be slow and well within the capacity of the available CS and RHR pumps.

Technical Specification 6.4, "Procedures," requires that procedures for the maintenance of systems be developed, maintained, and implemented. Administrative Procedure AP 0140, "Vermont Yankee Local Control Switching Rules," provides instructions for tagging equipment out-of-service for maintenance. Tagging Orders developed based on this procedure provide specific implementing instructions. Contrary to the above, on May 13, 2002, AP 0140 and Tagging Order 020425 did not provide adequate controls to ensure the proper alignment of two RCIC valves. As a result, RCIC-15 and RCIC-16 were unintentionally left open, creating a potential pathway for draining the refueling

cavity. This violation is being treated as a non-cited violation, consistent with Section VI.A.1 of the Enforcement Policy, issued May 1, 2000 (65FR25368). This issue was entered in VY's corrective action program as Event Report 2002-1193.  
**(NCV 50-271/02-04-03)**

.2 Routine Observations

a. Inspection Scope

On May 11, VY shut down for a mid-cycle outage. The primary purpose of the outage was to replace fuel bundles which had developed cladding leaks or were considered to be susceptible to developing leaks (based on a number of factors that had been evaluated prior to the outage), and to inspect additional fuel bundles to determine the cause and extent of the fuel cladding degradation.

The inspectors observed portions of the reactor and plant shutdown to verify that control room personnel were appropriately focused on plant operations and that technical specification requirements were satisfied.

During the outage, the inspectors reviewed what equipment was out of service to verify compliance with technical specifications, and what equipment was available to satisfy key safety functions. The inspectors verified that configuration changes accounted for scheduled variances in equipment and system availabilities.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing

.1 Human Performance Error During Core Spray System Quarterly Valve Surveillance

a. Inspection Scope

The inspectors reviewed a VY event report where personnel performance issues were identified as a causal factor for the "B" core spray (CS) subsystem inadvertently being left in an inoperable condition for three hours on March 31. Event report (ER) 2002-0638 documents that the "B" CS pump control switch was left in the "pull to lock" position at the completion of the "B" CS subsystem quarterly valve surveillance.

b. Findings

Green. A non-cited violation of TS 6.4, "Procedures," occurred when operators failed to follow the procedure for the "B" CS subsystem quarterly valve surveillance. Although the procedure directed that the pump control switch be returned to the "auto" position as a part of system restoration from testing, operators left the "B" CS pump control switch in the "pull to lock" position. Additionally, during a subsequent procedurally-directed two-party system lineup verification, operators failed to identify the discrepant condition.

As a result, the "B" CS subsystem was declared operable when it was actually in an inoperable condition. The problem was identified three hours later during a routine control board walkdown that was performed by a different operator.

This issue was considered more than minor because the failure to follow procedures for the operation of this safety-related equipment had a credible impact on plant safety. Specifically, the failure to operate the CS system in accordance with approved procedures affected the operability of the system. However, the inspectors determined this issue was of very low safety significance (Green) based on a Phase 1 evaluation of the SDP (Inspection Manual Chapter 0609) because the problem existed for only a short period of time, was readily identified and corrected, and the system was promptly returned to its normal standby alignment (operable).

Technical Specification 6.4, "Procedures," requires that written procedures be established and implemented for surveillance and testing requirements. VY Operating Procedure 4123, "Core Spray System Surveillance," Revision 34 (LPC#1), section B, "Motor-Operated Valve and CS-13A/B Check Valve Tests," step 5, states, "Place Core Spray Pump P-46-1A(B) to Auto." Contrary to the above, on March 31, operators did not place Core Spray Pump P-46-1B to Auto when directed by OP 4123. This violation is being treated as a non-cited violation, consistent with Section VI.A.1 of the Enforcement Policy, issued May 1, 2000 (65FR25368). This issue was entered in VY's corrective action program as ER 2002-0638. **(NCV 50-271/02-04-04)**

.2 Routine Observations

a. Inspection Scope

The inspector reviewed documentation and/or observed portions of testing related to the following surveillance tests using the guidance provided in NRC Inspection Procedure 71111, Attachment 22, "Surveillance Testing":

- Quarterly surveillance testing of core spray pump "A" on April 1, performed in accordance with OP 4123.
- Quarterly surveillance testing of the residual heat removal pumps on April 30 and May 2, performed in accordance with OP 4124.

b. Findings

No findings of significance were identified.

## **Emergency Preparedness [EP]**

### **1EP2 Alert Notification System Testing**

#### **a. Inspection Scope**

The inspector reviewed documentation submitted to the Federal Emergency Management Agency for approval of the alert and notification system (ANS). A contractor technician was interviewed and observed performing siren maintenance and testing. Siren records were reviewed for completeness and trends. The inspector also reviewed licensee actions regarding the tone alert radio program to ensure that portion of the ANS was being maintained for the population not covered by sirens. The review was conducted in accordance with NRC Inspection Procedure 71114, Attachment 02. The applicable planning standard, 10 CFR 50.47(b)(5) and related requirements in 10 CFR 50 Appendix E, Section IV.D were used as reference criteria.

#### **b. Findings**

No findings of significance were identified.

### **1EP3 Emergency Response Organization (ERO) Augmentation Testing**

#### **a. Inspection Scope**

The inspector reviewed the licensee's emergency plan for facility staffing commitments. The qualification and staffing documents were reviewed to ensure that sufficient numbers of responders were available. The procedure for initiating ERO call-in was reviewed and walked-through with an individual responsible for its implementation. Results from weekly pager tests and the most recent annual call-in drill was reviewed for timeliness. The review was conducted in accordance with NRC Inspection Procedure 71114, Attachment 03. The applicable planning standard, 10 CFR 50.47(b)(2) and the related requirements in 10 CFR 50, Appendix E were used as reference criteria.

#### **b. Findings**

No findings of significance were identified.

### **1EP4 Emergency Action Level (EAL) and Emergency Plan Changes**

#### **a. Inspection Scope**

The inspector reviewed recent emergency plan, EAL, and implementing procedure changes to determine if the changes resulted in a decrease of effectiveness of the emergency plan. Verification of annual EAL training for the three states was performed. The licensee's 10 CFR 50.54(q) review process was assessed. The review was conducted in accordance with NRC Inspection Procedure 71114, Attachment 04. The applicable requirements in 10 CFR 50.54(q), 10 CFR 50.47(b), and 10 CFR 50 Appendix E were used as reference criteria.

b. Findings

No findings of significance were identified.

1EP5 Correction of Emergency Preparedness Weaknesses and Deficiencies

a. Inspection Scope

The inspector reviewed corrective actions identified by the licensee during quality assurance audits, exercise or drill reports, self-assessments, and from self-revealing problems resulting from regularly scheduled surveillances. Event Reports assigned to the EP department were also reviewed to determine significance of the issues, timeliness of resolution, and to determine if repeat problems were occurring. The inspector reviewed the reports for the 2000 and 2001 10 CFR 50.54(t) reviews to assess that the reviews met NRC requirements and if any repeat issues were identified. The reviews were conducted in accordance with Inspection Procedure 71114, Attachment 05. The applicable planning standard, 10 CFR 50.47(b)(14) and the requirements in 10 CFR Appendix E, Section IV.F.2.g, were used as reference criteria.

b. Findings

No findings of significance were identified.

**2. RADIATION SAFETY**

**Occupational Radiation Safety [OS]**

2OS1 Access Control

a. Inspection Scope

The inspector reviewed exposure significant work areas, high radiation areas, and airborne radioactivity areas in the plant and evaluated associated controls and surveys of these areas to determine if the controls (i.e., surveys, postings, barricades) were acceptable. For these areas, the inspector reviewed radiological job requirements and attended job briefings to determine if radiological conditions in the work area were adequately communicated to workers through briefings and postings. The inspector also verified radiological controls, radiological job coverage, and contamination controls to ensure the accuracy of surveys and applicable posting and barricade requirements. The inspector determined if prescribed radiation work permits (RWPs), procedure and engineering controls were in place; whether surveys and postings were complete and accurate; and if air samplers were properly located. The inspector conducted reviews of RWPs used to access these and other high radiation areas to identify the acceptability of work control instructions or control barriers specified. The inspector reviewed electronic pocket dosimeter alarm set points (both integrated dose and dose rate) for conformity with survey indications and plant policy. Plant technical specification 6.5 and the requirements contained in 10 CFR 20, Subpart G were utilized as the standard for necessary barriers.

The primary focus during this inspection was work being conducted in support of the mid-cycle outage (MCO22). Outage activities observed included: "A" recirculation pump seal replacement; under vessel replacement of power monitors; reactor disassembly; and, fuel sipping.

b. Findings

No findings of significance were identified.

2OS2 ALARA Planning and Controls

a. Inspection Scope

The inspector reviewed work to be performed during MCO22. Areas included a review of the use of low dose waiting areas, a review of on-job supervision provided to workers and, a review of individual exposures from selected work groups. An evaluation of engineering controls utilized to achieve dose reductions, analysis of licensee source term reduction plans, and the bases for VY's outage goal of not more than 12.504 person-rem was also conducted.

The inspector observed radiation worker and radiation protection technician performance during high dose rate or high exposure jobs to determine if workers demonstrated proper techniques to maintain occupational exposures as low as is reasonably achievable (ALARA) and if their training/skill level was sufficient with respect to the radiological hazards and the work involved. The jobs observed are listed in Section 2OS1 above, and include: "A" recirculation pump seal replacement (1.123 person-rem goal); under vessel replacement of power monitors (1.332 person-rem goal); reactor disassembly/reassembly (5.093 person-rem goal); and, fuel sipping (0.509 person-rem goal).

The inspector reviewed ALARA job evaluations, exposure estimates, and exposure mitigation requirements and compared ALARA plans with the results achieved. A review was conducted of the integration of ALARA requirements into work procedures and RWP documents, the accuracy of person-hour estimates and person-hour tracking, and generated shielding requests and their effectiveness in dose rate reduction.

A review of actual exposure results versus initial exposure estimates for current work was conducted including: comparison of estimated and actual dose rates and person-hours expended; determination of the accuracy of estimations to actual results; and determination of the level of exposure tracking detail, exposure report timeliness and exposure report distribution to support control of collective exposures to determine conformance with the requirements contained in 10 CFR 20.1101(b).

b. Findings

No findings of significance were identified.

2OS3 Radiation Monitoring Instrumentation

a. Inspection Scope

The inspector reviewed field instrumentation utilized by health physics technicians and plant workers to measure radioactivity including; portable field survey instruments, friskers, portal monitors and small article monitors. The inspector conducted a review of instruments observed, specifically verification of proper function and certification of appropriate source checks for these instruments, which were utilized to ensure that occupational exposures were maintained in accordance with 10 CFR 20.1201.

b. Findings

No findings of significance were identified.

**4. OTHER ACTIVITIES [OA]**

4OA2 Performance Indicator Verification

.1 Emergency Preparedness Cornerstone

a. Inspection Scope

The inspector reviewed the licensee's process for identifying the data that is utilized to determine the values for the three EP performance indicators (PI) which are: 1) Drill and Exercise Performance, 2) ERO Participation, and 3) ANS Reliability. The review assessed data from the third and fourth quarters of 2001 and the first quarter of 2002. Classification, notification and protective action opportunities were reviewed from licensed operator requalification sessions and a biennial exercise. Attendance records for drill and exercise participation was reviewed. Details of the siren testing and data collection were discussed with individuals responsible for that program. The inspector reviewed this data using the criteria of NEI 99-02, Revision 2, "Regulatory Assessment Performance Indicator Guideline."

b. Findings

No findings of significance were identified.

4OA3 Event Followup

On April 20, an earthquake occurred in northeast New York state and was felt at VY. The ground motion was not of sufficient magnitude to activate the seismic switches in the plant's seismic monitor. VY reviewed the criteria for emergency classification of a seismic event specified in AP 3125, "Emergency Plan Classification And Action Level Scheme," revision 18, and as further discussed in the VY EAL Technical Bases Document, revision 3, and concluded that no emergency classification was required. Proper operation of the seismic monitor was verified by the satisfactory completion of OP 4396, "Seismic Monitoring System Functional Test." VY performed walkdowns of plant systems as specified in OP 3127, "Natural Phenomena," as a precaution while the seismic monitor was being tested. No indications of earthquake damage were identified

during the walkdowns. VY confirmed that inspections of the Vernon and Bellows Falls dams also identified no earthquake damage.

The inspectors responded to the site to assess VY's response to the event, including their basis for having made no emergency classification. No findings of significance were identified.

#### 4OA4 Cross-Cutting Issues

A performance trend appeared to be developing in several cornerstone areas with human performance errors being the common element. The following issues were identified since January 2002:

FIN 50-271/02-02-01	Undetected failure of the manual pressure control valve for the steam jet air ejectors
FIN 50-271/02-02-02	Undetected failure of the drywell floor drain sump fill timer
FIN 50-271/02-02-03	Operator Workaround - HPCI turbine vibration monitor provides spurious upscale indication [problem had not been reported as a workaround]
NCV 50-271/02-02-04	Failure to follow procedure during HPCI surveillance [failure to trip HPCI turbine when required]
NCV 50-271/02-04-01	Failure to Follow Procedure for Draining the HPCI Turbine Exhaust Drain Pot Results in Valve Being Left Open
NCV 50-271/02-04-02	Corrective Action For RHRSW Motor Cooling Pipe Degradation Not Effective And No Further Action Taken
NCV 50-271/02-04-03	Inadequate Procedure for Tagging And Poor Human Performance Cause Flooding Of RCIC Steam Line
NCV 50-271/02-04-04	Failure to Follow Procedure During Restoration From CS Valve Surveillance Causes System to Be Inoperable

The causal relationships of these errors were that personnel failed to follow procedures or otherwise failed to recognize degraded conditions that should have been captured in the corrective action process. These problems predominantly occurred in the operations department. The individual findings each have a direct impact on safety, increasing the likelihood of initiating events, or affecting the reliability, operability and functionality of systems important to plant safety. These findings are being referenced to aid in the integration of cross cutting issues for assessment purposes in accordance with NRC Inspection Manual Chapter 0612 guidance.

#### 4OA6 Exit Meeting

On June 7, 2002, the resident inspectors presented their overall findings to members of VY management led by Kevin Bronson, Plant Manager, who acknowledged the findings presented.

The inspectors asked whether any materials examined during the inspection should be considered proprietary. Where proprietary information was identified, it was returned to VY after review.

## ATTACHMENT 1

## SUPPLEMENTARY INFORMATION

A. List of Items Opened, Closed and DiscussedOpened and Closed

NCV 50-271/02-04-01	Failure to Follow Procedure for Draining the HPCI Turbine Exhaust Drain Pot Results in Valve Being Left Open
NCV 50-271/02-04-02	Corrective Action For RHRSW Motor Cooling Pipe Degradation Not Effective And No Further Action Taken
NCV 50-271/02-04-03	Inadequate Procedure for Tagging And Poor Human Performance Cause Flooding Of RCIC Steam Line
NCV 50-271/02-04-04	Failure to Follow Procedure During Restoration From CS Valve Surveillance Causes System to Be Inoperable

B. List of Acronyms

ALARA	As Low As Is Reasonably Achievable
AP	Administrative Procedure
CFR	Code of Federal Regulations
DBT	Design Basis Threat
EAL	Emergency Action Level
EDG	Emergency Diesel Generator
ER	Event Report
ERO	Emergency Response Organization
HPCI	High Pressure Coolant Injection
IPEEE	Individual Plant Evaluation of External Events
LCO	Limiting Condition for Operation
MIC	Microbiologically Induced Corrosion
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OP	Operating Procedure
PI	Performance Indicator
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RWP	Radiation Work Permit
SDP	Significance Determination Process
SRM	Source Range Monitor
SW	Service Water
TS	Technical Specification
VY	Vermont Yankee