

July 27, 2001

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 50-271/01-05

Dear Mr. Balduzzi:

On June 30, 2001, the NRC completed an inspection at your Vermont Yankee facility. The enclosed report documents the inspections findings which were discussed on July 12, 2001, 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.

The inspectors identified one finding of very low safety significance (Green) regarding the inadequate design of containment isolation valves by a vendor that led to leak rate test failures during the Spring 2001 refueling outage. No violation of NRC requirements was identified.

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Sincerely,

/RA J. Schoppy for/

Glenn W. Meyer, Chief
Projects Branch 3
Division of Reactor Projects

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

Enclosure: Inspection Report 50-271/01-05
Attachment: Supplementary Information

M. A. Balduzzi

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cc w/encl:

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No. 50-271

Licensee No. DPR-28

Report No. 50-271/01-05

Licensee: Vermont Yankee Nuclear Power Corporation

Facility: Vermont Yankee Nuclear Power Station

Location: Vernon, Vermont

Dates: May 20 - June 30, 2001

Inspectors: Brian J. McDermott, Senior Resident Inspector
Edward C. Knutson, Resident Inspector

Approved by: Glenn W. Meyer, Chief
Projects Branch 3
Division of Reactor Projects

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SUMMARY OF FINDINGS

IR 05000271-01-05, on 05/20 - 06/30/01; Vermont Yankee Nuclear Power Station; Vermont Yankee Nuclear Power Corporation; Permanent Plant Modifications.

This inspection was performed by the resident inspectors. One Green finding associated with the Barrier Integrity cornerstone was identified by the inspectors. The significance of a finding is indicated by its color (Green, White, Yellow, Red) and is determined using the Significance Determination Process (SDP) in Inspection Manual Chapter 0609. 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/NRR/OVERSIGHT/index.html>.

Inspector Identified Findings

Barrier Integrity

- **Green.** Required testing of the high pressure coolant injection (HPCI) turbine exhaust check valves during the Spring 2001 refueling outage found that the leakage rates of both valves exceeded the Technical Specification allowable leak rate limit. The safety related valves were new in this application and had been installed during the previous refueling outage. The inspectors concluded that the valves were not adequately designed for this application. The valves were purchased from a qualified safety-related supplier and the inspectors did not identify any violations associated with VY's procurement, installation, or initial testing of the valves. As corrective action for the test failures, VY worked with the vendor to install stronger springs and stiffer radial guides.

This issue was considered more than minor because the failure to provide reliable isolation check valves can have a credible impact on safety and affect the integrity of the reactor containment. This issue was determined to be of very low safety significance because any post-accident leakage through these valves would have a tortuous release path to the reactor building, greatly limiting the size of a potential release, and would be filtered by the standby gas treatment system. Based on this information, it was determined that the change in large early release frequency (delta-LERF) resulting from the HPCI turbine exhaust valve failures was very low. (Section 1R17.1)

Licensee Identified Findings

None

Report Details

Summary of Plant Status: At the beginning of the inspection period, Vermont Yankee (VY) was returning to full power operation following their twenty-second refueling outage. On May 20, operators synchronized the main generator to the grid and 100 percent power was achieved on May 22. With the exception of brief power reductions for control rod pattern adjustments, the plant operated at 100 percent power for the remainder of the inspection period.

1. REACTOR SAFETY

Initiating Events, Mitigating Systems, Barrier Integrity [REACTOR - R]

1R04 Equipment Alignment

a. Inspection Scope

The inspectors performed partial system walkdowns (visual inspections) to verify system alignments and to identify any discrepancies that would impact system operability. The inspectors reviewed selected valve position, electrical power availability, and the general condition of major system components. During this inspection period, the following systems were inspected:

- Station 125 volt DC power systems, based on their high risk significance and full replacement of both main station batteries and one alternate shutdown battery.
- Residual heat removal (RHR) subsystem A, based on its increased risk significance during planned maintenance on RHR subsystem B.
- Core spray system, based on its increased risk significance during maintenance on RHR subsystem B.

b. Findings

No findings of significance were identified.

1R05 Fire Protection

a. Inspection Scope

The inspectors toured plant areas important to reactor 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 inspectors identified fire areas important to plant risk based on the Fire Protection Program and the Individual Plant Examination External Events (IPEEE). The inspection elements identified in NRC Inspection Procedure 71111.05, Fire Protection, were used in evaluating the following plant areas:

- Control room, based on maintenance adjacent to the control room on June 1 involving transient combustible materials.

- Fire Zone RB-1, based on increased importance during unavailability of RHR subsystem B on June 19.
- Fire Zone RB-3, performed in conjunction with RHR subsystem A walkdown on June 19.
- 4 kV switchgear rooms, based on high risk significance during alternate shutdown battery (AS-1) replacement on June 26.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance

a. Inspection Scope

The inspectors observed preventive maintenance on the RHR subsystem B heat exchanger during the week of June 18. Guidance contained in NRC Inspection Procedure 71111, Attachment 7, "Heat Sink Performance" and industry guidance were referenced during this inspection. VY currently inspects and cleans the RHR heat exchangers on a once-per-cycle frequency and thermal performance testing is currently planned for the next refueling outage.

VY's as-found heat exchanger inspection was performed and documented in accordance with procedure OP 5265, "Service Water Component Inspection and Acceptance Criteria." The inspectors reviewed the results of this routine inspection and cleaning with cognizant system engineering and maintenance personnel.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification

a. Inspection Scope

On June 20 the inspectors observed three simulator scenarios and a Protective Action Recommendation exercise during requalification training to assess the performance of the operators and the evaluation by VY's training staff. The inspectors' assessment was in accordance with NRC Inspection Procedure 71111.11, "Licensed Operator Requalification Program."

b. Findings

No findings of significance were identified.

1R12 Maintenance Rule Implementation

a. Inspection Scope

The inspectors reviewed VY's implementation of the Maintenance Rule for structures, systems and components that exhibited performance problems. The inspectors also verified that a sample of equipment issues identified during routine operations and testing were being entered into the corrective action process. 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. The following performance issues were reviewed during this inspection period:

- Main steam isolation valve 80D local leak rate test failure. The inspectors reviewed Maintenance Rule program data for the nuclear boiler system on June 14.
- Uninterruptible power supply UPS-1B, under-voltage relay failure. VY maintenance support personnel determined this failure did not impact the 480 volt system functions monitored under the Maintenance Rule. The inspectors reviewed VY's justification on June 22.
- RHR pump C, failure to start. The inspectors reviewed the 4 kV system performance on June 29, based on its high risk significance and the breaker failure for RHR pump C that occurred during the refueling outage (reference NRC Inspection Report 50-271/01-04, Section 1R04).

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessment and Emergent Work Evaluation

a. Inspection Scope

The inspectors reviewed planned and emergent maintenance at VY based on the guidance in NRC Inspection Procedure 71111, Attachment 13, "Maintenance Risk Assessment and Emergent Work Control." The following activities were reviewed:

- Troubleshooting on the main turbine electronic pressure regulator. The inspectors observed VY's response to oscillations in reactor pressure, first observed on May 29. The oscillations were traced to a failed component that was subsequently replaced.
- Planned maintenance on control room high energy line break barriers. On June 5 the inspectors reviewed VY's risk analysis for this maintenance and subsequently confirmed the actual of out-of-service time was bounded.

- Planned maintenance on RHR subsystem B. On June 14 the inspectors reviewed VY's maintenance plan and associated risk assessment.
- Emergent work affecting the 345 kV switchyard. On June 19 the inspectors reviewed VY's risk assessment for emergent work on the grid that required VY to open breakers on the ring bus.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed a sample of operability evaluations prepared by VY. The inspectors used the guidance provided in NRC Generic Letter 91-18 to assess VY's evaluation of the degraded or non-conforming conditions. The following plant issues were reviewed:

- Environmental qualification (EQ) issues identified in ER 2001-0794. On June 13 the inspectors reviewed VY's evaluation and extent of condition review after discovering certain fuse blocks had exceeded their EQ life. The evaluation took credit for conservatism in the original EQ life determination and concluded there was no impact on operability.
- Motor operated valve RHR-25B did not produce the calculated torque output during testing, ER 2001-1493. The inspectors reviewed VY's operability determination dated June 19 and subsequently discussed the issue with VY's motor operated valve program coordinator.

b. Findings

No findings of significance were identified.

1R17 Permanent Plant Modifications

.1 Inadequate HPCI Turbine Exhaust Check Valve Design

a. Inspection Scope

VY discovered that the high pressure coolant injection (HPCI) turbine exhaust check valves (HPCI-3 and HPCI-4) would not pass local leak rate test criteria during the Spring 2001 refueling outage. The leakage through these valves caused the calculated minimum leakage pathway to exceed the Technical Specification Section 6.7C limit of 0.60 L_a. VY modified the HPCI turbine exhaust check valves during the refueling outage and the valves were satisfactorily tested prior to restarting the plant.

The inspectors reviewed VY's response to the test failure, the design problems leading to the failure, VY's corrective actions, and the as-left leak rate testing.

b. Findings

The inspectors concluded that the nozzle check valves installed during the 1999 refueling outage at VY were not adequately designed for the HPCI turbine exhaust line application. This issue was determined to be of very low safety significance (Green).

VY replaced HPCI-3 and HPCI-4 during the 1999 refueling outage. A nozzle check valve design was selected as a replacement for the original swing check valve design to reduce maintenance and improve reliability. The valves were designed and fabricated by a qualified safety-related supplier on VY's approved vendor list.

VY's investigation of the Spring 2001 test failures concluded that valve disks did not seat properly due to weak springs (internal to the valves) and bent radial guides. To correct the problems identified during the outage, VY worked with the vendor to install stronger springs and stiffer radial guides.

This issue was considered more than minor, because the failure to provide reliable isolation valves can have a credible impact on safety and affect the integrity of the reactor containment. This issue was determined to be Green (of very low safety significance) after a review of NRC Inspection Manual Chapter 0609, Appendix H and consultation with a Region I Senior Reactor Analyst (SRA). The inspectors noted that the current version of Appendix H does not specifically address containment isolation issues for a BWR Mark I containment. However, any potential leakage out of the primary containment would be through the HPCI turbine gland seals into the reactor building. The reactor building exhaust would be filtered by the standby gas treatment system under post accident conditions. Based on this information, it was determined that the change in LERF (delta-LERF) resulting from the HPCI turbine exhaust valve failures was very low.

The safety related valves were purchased from a qualified safety-related supplier and the inspectors did not identify any violations associated with VY's procurement, installation, or initial testing of the valves. VY has initiated actions to improve its quality assurance oversight of contracted engineering services, review the issue for Part 21 applicability, and review the modification scoping process in association with ER 2001-0901. **(FIN 50-271/01-05-01)**

1R19 Post-Maintenance Testing

a. Inspection Scope

The inspectors reviewed and/or observed portions of the post maintenance testing associated with the RHR and RHR service water (RHRSW) online maintenance performed during the week of June 18. NRC Inspection Procedure 71111, Attachment 19, "Post- Maintenance Testing" and VY procedure OP 4124, "Residual Heat Removal and RHR Service Water System Surveillance" were referenced during this review.

The inspectors verified that the OP 4124 acceptance criteria are consistent with Technical Specification requirements. Test results for the RHR motor operated valves, RHR subsystem B pumps and RHRSW subsystem B pumps were reviewed and compared to the acceptance criteria.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors reviewed and observed portions of surveillance testing for VY's automatic depressurization system on May 25. NRC Inspection Procedure 71111, Attachment 22, "Surveillance Testing" and VY procedure OP 4122, "Auto Blowdown System Surveillance" were referenced during this inspection.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES [OA]

4OA3 Event Follow-up

.1 (Closed) LER 50-271/01-02-00: HPCI Turbine Exhaust Line Check Valve Testing Results in Primary Containment Leak Rate In Excess Of Allowable Due to Valve Design

This Licensee Event Report was reviewed as part of the inspection documented in Section 1R17.1 of this inspection report. The check valves were not adequately designed for this application and consequently failed leak rate testing during VY's Spring 2001 refueling outage. The safety class valves were supplied by a qualified safety-related vendor on VY's approved vendor list. During the refueling outage the valves were modified and tested satisfactorily. No violations were identified during the review of VY's procurement, installation, or testing of the valves. This LER is closed.

4OA6 Exit Meeting

On July 12, 2001, the resident inspectors presented their overall findings to members of VY management led by Kevin Bronson, Plant Manager. VY management stated that none of the information reviewed by the inspectors was considered proprietary.

ATTACHMENT 1

SUPPLEMENTARY INFORMATION

a. List of Items Opened and Closed

LER 05000271/2001-002-00: HPCI Turbine Exhaust Line Check Valve Testing Results in Primary Containment Leak Rate In Excess Of Allowable Due to Valve Design. (Section 4OA3.1)

FIN 50-271/01-05-01: Inadequate HPCI Turbine Exhaust Check Valve Design. (Section 1R17.1)

b. List of Acronyms Used

CFR	Code of Federal Regulations
EQ	Environmental Qualification
ER	Event Report
HPCI	High Pressure Coolant Injection
IPEEE	Individual Plant Examination External Events
LER	Licensee Event Report
LERF	Large Early Release Frequency
NRC	Nuclear Regulatory Commission
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
SDP	Significance Determination Process
SRA	Senior Reactor Analyst
TS	Technical Specifications
VY	Vermont Yankee