September 29, 2006

Mr. Theodore A. Sullivan
Site Vice President
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
320 Governor Hunt Road
Vernon, VT 05354

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - NRC COMPONENT DESIGN BASIS INSPECTION REPORT 05000271/2006007

Dear Mr. Sullivan:

On August 17, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Vermont Yankee Nuclear Power Station. The enclosed inspection report documents the inspection findings, which were discussed on August 17, 2006, with Mr. James Maguire and other members of your staff.

The 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. In conducting the inspection, the team examined the adequacy of selected components and operator actions to mitigate postulated transients, initiating events, and design basis accidents. The inspection also reviewed Entergy's response to selected operating experience issues. The inspection involved field walkdowns, examination of selected procedures, calculations and records, and interviews with station personnel.

This report documents three NRC-identified findings all of which were of very low safety significance (Green). The findings were determined to involve violations of NRC requirements. However, because of the very low safety significance of the findings and because they were entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section VI.A of the NRC Enforcement Policy. If you contest any of the NCVs in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspectors at the Vermont Yankee Nuclear Power Station.

In accordance with 10 CFR 2.390 of the NRC=s “Rules of Practice,” a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records 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/

Lawrence T. Doerflein
Engineering Branch 2
Division of Reactor Safety

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

Enclosure: Inspection Report 05000271/2006007

cc w/encl:
M. R. Kansler, President, Entergy Nuclear Operations, Inc.
G. J. Taylor, Chief Executive Officer, Entergy Operations
J. T. Herron, Senior Vice President and Chief Operating Officer
C. Schwarz, Vice-President, Operations Support
O. Limpias, Vice President, Engineering
J. M. DeVincentis, Manager, Licensing, Vermont Yankee Nuclear Power Station
Operating Experience Coordinator, Vermont Yankee Nuclear Power Station
W. Maguire, General Manager, Plant Operations, Entergy Nuclear Operations, Inc.
N. Rademacher, Director NSA, Vermont Yankee Nuclear Power Station
J. F. McCann, Director, Licensing
C. D. Faison, Manager, Licensing
M. J. Colomb, Director of Oversight, Entergy Nuclear Operations, Inc.
T. C. McCullough, Assistant General Counsel, Entergy Nuclear Operations, Inc.
J. H. Sniezek, PWR SRC Consultant
M. D. Lyster, PWR SRC Consultant
S. Lousteau, Treasury Department, Entergy Services, Inc.
Administrator, Bureau of Radiological Health, State of New Hampshire
Chief, Safety Unit, Office of the Attorney General, Commonwealth of Mass.
J. E. Silberg, Pillsbury, Winthrop, Shaw, Pittman LLP
G. D. Bisbee, Esquire, Deputy Attorney General, Environmental Protection Bureau
J. Block, Esquire
J. P. Matteau, Executive Director, Windham Regional Commission
D. Katz, Citizens Awareness Network (CAN)
R. Shadis, New England Coalition Staff
G. Sachs, President/Staff Person, c/o Stopthesale
C. McCombs, Director, Commonwealth of Massachusetts, SLO Designee
State of New Hampshire, SLO Designee
State of Vermont, SLO Designee

<u>Distribution w/encl:</u> **(via E-mail)**
S. Collins, RA
M. Dapas, DRA
R. Powell, DRP
T. Walker, DRP
A. Blough, DRS
L. Doerflein, DRS
K. Mangan, DRS
B. Sosa, RI OEDO
D. Roberts, NRR
J. Shea, PM, NRR
J. Boska, Backup PM, NRR
D. Pelton, DRP, Senior Resident Inspector
A. Rancourt, DRP, Resident OA
Region I Docket Room (with concurrences)
ROPreports@nrc.gov (All IRs)

SUNSI Review Complete: ______LTD________ (Reviewer's Initials)

DOCUMENT NAME: E:\Filenet\ML062720159.wpd
After declaring this document "An Official Agency Record" it will be released to the Public.
To receive a copy of this document, indicate in the box: "**C**" = Copy without attachment/enclosure "**E**" = Copy with attachment/enclosure "**N**" = No copy

OFFICE	RI/DRS	RI/DRS	RI/DRS	RI/DRS	
NAME	KMangan/KAM	WCook/WAC	RPowel/RJP	LDoerflein/LTD	
DATE	09/25/06	09/28/06	09/25/06	09/29/06	

OFFICE					
NAME					
DATE					

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos.	50-271
License Nos.	DPR-28
Report Nos.	05000271/2006007
Licensee:	Entergy Nuclear Vermont Yankee, LLC
Facility:	Vermont Yankee Nuclear Power Station
Location:	Vernon, Vermont
Dates:	July 10 to August 17, 2006
Inspectors:	K. Mangan, Senior Reactor Inspector (Team Leader) B. Bickett, Reactor Inspector J. Krafty, Reactor Inspector A. Patel, Reactor Inspector A. Gaudette, Student Engineer (Trainee) C. Baron, NRC Mechanical Contractor R. Cooney NRC Electrical Contractor
Approved by:	Lawrence T. Doerflein, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000271/2006007; 07/10/2006 - 08/17/2006; Vermont Yankee Power Station; Component Design Bases Inspection.

The report covers the Component Design Basis Inspection conducted by a team of five NRC inspectors and two NRC contractors. Three findings of very low risk significance (Green) were identified, all were considered to be non-cited violations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. NRC-Identified and Self-Revealing Findings.

Cornerstone: Mitigating Systems

- Green. The team identified a green, non-cited violation of 10CFR50, Appendix R (App R), General Requirements for failure to create and schedule surveillances to ensure App R components were operable. The team reviewed two modifications related to the replacement of 24 VDC ECCS Power supply components with a Division I, II and designated App R power converters. The App R converter was installed to supply power to the Division II panel in the event of a postulated design basis fire. The team determined that a periodic surveillance had not been created to verify the circuit from the App R converter to the distribution panel was operable after the equipment was placed in service. Entergy intends to create a new surveillance to correct the omission.

  The issue is considered to be more than minor because if left uncorrected it could lead to a more significant safety concern and affect the Mitigating System Cornerstone attribute to ensure the availability of equipment. The issue was evaluated in accordance with the Appendix F Fire SDP and because the circuit had been tested satisfactorily as part of the 2005 modification post maintenance test the issue screens to green. This finding has a crosscutting aspect in Human Performance Resources related to ensuring equipment procedures are available. (Section 1R21-.2.1.9)

- Green. The team identified a green, non-cited violation of Technical Specification 6.4 Procedures, for Entergy's failure to establish an adequate procedure to address degraded service water (SW) flow conditions. The station's Loss of Service Water procedure permits operators to bypass the SW strainer if the strainer backwash feature was unavailable. The team determined Entergy had not evaluated the potential for river water debris to compromise the availability of downstream safety-related components. Entergy is currently evaluating design and procedural improvements and has entered this issue into their corrective action program for resolution.

  The finding is more than minor because it is associated with the procedure quality attribute of the Mitigating System cornerstone and affects its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding was determined to be of very low safety significance (Green) since it did not result in a loss of safety system function and the team did not identify any events where operators had bypassed strainers and challenged safety systems. (Section 1R21-.2.1.11)

- Green. The team identified a green, non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for failure to take actions to correct a condition adverse to quality related to significant flow oscillations caused by the Terry turbine flow/speed controllers for both the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems. Entergy observed large flow oscillations during injection into the vessel from both the RCIC and HPCI systems following a plant trip in July 25, 2005. The team determined the licensee failed to take actions to correct the flow oscillation conditions and the operability determination performed following the event did not address all equipment performance deficiencies. The licensee has entered the issue into their corrective action program, performed an operability determination and implemented compensatory measures to address the issue.

  The finding is more than minor because it is associated with the equipment performance attribute of the Mitigating system cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events. The finding was determined to be of very low safety significance (Green) since it did not result in a loss of safety system function. This issue has a crosscutting aspect in the area of Problem Identification and Resolution, corrective actions, in that the licensee failed to take appropriate corrective actions to address this safety issues in a timely manner. (Section 1R21-.2.1.14)

B. Licensee-identified Violations.

None.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (IP 71111.21)

.1 Inspection Sample Selection Process

The team selected risk significant components and operator actions for review using information contained in the Vermont Yankee (VY) Probabilistic Risk Assessment (PRA) and the U.S. Nuclear Regulatory Commission's (NRC) Standardized Plant Analysis Risk (SPAR) model. Additionally, the VY Significance Determination Process (SDP) Phase 2 Notebook, Revision 2, was referenced in the selection of potential components and actions for review. In general, the selection process focused on components and operator actions that had a risk achievement worth (RAW) factor greater than 2.0 or a Risk Reduction Worth (RRW) factor greater than 1.005. The components selected were located within both safety-related and non-safety related systems, and included a variety of components such as turbines, pumps, fans, generators, transformers and valves. The components selected involved 5 different plant systems. Additionally, the team reviewed the components and operator actions selected during the Vermont Yankee Engineering Inspection (IR 2004008), completed in December 2004. In general, the team did not select those components that had received an in depth review during that inspection.

The team initially compiled a list of 60 components and 8 operator actions based on the risk factors previously mentioned. The team performed a margin assessment to narrow the focus of the inspection to 16 components and 4 operator actions. The team's evaluation of possible low design margin included consideration of original design issues, margin reductions due to modifications, or margin reductions identified as a result of material condition/equipment reliability issues. The assessment included items such as failed performance test results, significant corrective action history, repeated maintenance, maintenance rule (a)1 status, operability reviews for degraded conditions, NRC resident inspector input of equipment problems, system health reports and industry operating experience. The margin review of operator actions included complexity of the action, time to complete action and extent of training on the action. Consideration was also given to the uniqueness and complexity of the design and the available defense-in-depth margins. The inspection performed by the team was conducted as outlined in Inspection Procedure 71111.21. This inspection effort included walk-downs of selected components, interviews with operators, system engineers and design engineers, and reviews of associated design documents and calculations to assess the adequacy of the components to meet both design bases and beyond design basis requirements. A summary of the reviews performed for each component, operator action, operating experience sample, and the specific inspection findings identified are discussed in the following sections of the report. Documents reviewed for this inspection are listed in the attachment.

.2 Results of Detailed Reviews

.2.1 Detailed Component Design Reviews (16 Samples)

.2.1.1 Emergency Diesel Generator Heat Exchangers, EDG-1-1A

a. Inspection Scope

The team inspected the emergency diesel generator (EDG) heat exchangers to verify that they were capable of handling the heat loads of the EDG during design basis events. The inspection consisted of a walkdown of the associated equipment, interviews with system and design engineers, and review of emergency diesel generator documents. The team reviewed eddy current test results of the heat exchanger tubes to verify the integrity of the tubes. The team reviewed the licensee's response to Generic Letter (GL) 89-13, completed heat exchanger visual inspections, and heat exchanger surveillance trend data to verify that the licensee had implemented commitments and verified the heat exchangers were not fouled. The team also reviewed calculations to verify that the established operating limits were appropriate.

b. Findings

No findings of significance were identified.

.2.1.2 Residual Heat Removal Pump, P-10-1A

a. Inspection Scope

The team inspected the 'A' residual heat removal (RHR) pump in order to determine if the pump could meet the design basis requirements for all accident conditions. The inspection consisted of a walkdown of the component, interviews with the system and design engineers, and a review of RHR pump documents. The team reviewed Technical Specifications (TS), the Updated Final Safety Analysis Report (UFSAR), the RHR Design Basis Document (DBD), and calculations to determine the required flows, pressures, and operating conditions for the various system configurations. The team evaluated calculations, technical evaluations, pump curves, condition reports, and In-Service Test (IST) trend data to ensure that TS and design basis required flows and pressures could be achieved, net positive suction head (NPSH) requirements were met, and that IST acceptance criteria were appropriate. The RHR pump seal qualification technical evaluation was reviewed to verify that the seals were qualified for post Loss of Coolant Accident (LOCA) and post Anticipated Transient Without Scram accidents with increased seal water temperatures due to Vermont Yankee's Extended Power Uprate. The team also reviewed the licensee's response to NRC Bulletin 88-04 to verify that the RHR pumps were not subject to failure from inadequate minimum flow or dead-heading from a parallel higher head RHR pump.

b. Findings

No findings of significance were identified.

.2.1.3 Residual Heat Removal Heat Exchanger, E-14-1A

a. Inspection Scope

The team inspected the E-14-1A RHR heat exchanger to verify the capability of the equipment to remove design basis heat loads. The inspection consisted of a walkdown of the equipment, interviews with the system and design engineers, and a review of RHR heat exchanger documentation. The team reviewed eddy current data, calculations, and reports to verify the integrity of the tubes and that the criteria used for plugging tubes were appropriate. Calculations, thermal performance test results, and specification sheets were reviewed to verify that the heat exchangers could remove the design basis heat load from the reactor. The team reviewed the licensee's response to GL 89-13, as well as work orders, operating and nondestructive examination procedures, and inspection results to verify that the licensee was meeting its commitments stated in the response to the Generic Letter, and that the preventive maintenance was adequate to ensure that the heat exchangers remained operable.

b. Findings

No findings of significance were identified.

.2.1.4 RHR Injection Valve, V10-27A

a. Inspection Scope

The team inspected the 'A' loop RHR injection valve to verify that it was capable of meeting its design basis requirements. The inspection consisted of a walkdown of the equipment, interviews with the motor operated valve (MOV) engineers, and a review of the valve documentation. IST tests were reviewed to verify that the stroke time acceptance criteria were in accordance with the UFSAR, DBD, and accident analysis assumptions. The team reviewed dynamic test results and calculations to verify that thrust and torque limits, and actuator settings, were correct. Periodic test results were reviewed to determine if there were any adverse trends. Additionally, the team assessed procedures and calculations to verify that the licensee implemented the recommended actions of GL 89-10. The licensee's MOV preventive maintenance program was reviewed to determine if the valve lubrication and inspection was effective in identifying and/or preventing stem nut failures. The stem nut fabrication work orders were also reviewed to determine if appropriate quality control measures were used in the fabrication process.

b. Findings

No findings of significance were identified.

.2.1.5 RHR Heat Exchanger Bypass Valve, V10-65A

a. Inspection Scope

The team inspected the 'A' loop RHR heat exchanger bypass valve to verify that it was capable of meeting its design basis requirements. The inspection consisted of a walkdown of the equipment, interviews with the MOV Engineers, and a review of the valve documentation. IST tests were reviewed to verify that the stroke time acceptance criteria were in accordance with the UFSAR, DBD, and accident analysis assumptions. The team reviewed calculations to verify that thrust and torque limits, and actuator settings, were correct. Periodic test results were reviewed to determine if there were any adverse trends. Additionally, the team assessed procedures and calculations to verify that the licensee implemented the recommended actions of GL 89-10. The licensee's MOV preventive maintenance program was reviewed to determine if the valve lubrication and inspection was effective in identifying and/or preventing stem nut failures. The stem nut fabrication work orders were also reviewed to determine if appropriate quality control measures were used in the fabrication process.

b. Findings

No findings of significance were identified.

.2.1.6 Diesel Fire Pump, P-40-1A

a. Inspection Scope

The team inspected the diesel fire pump to verify that it could meet its safety function as a back up to the service water pumps for both RHR heat exchanger cooling and alternate core injection. The team reviewed the preventive maintenance program, condition reports, and system health reports to determine if any maintenance issues were present that would indicate the pump was unable to perform its safety function. Surveillance test results and test trend data was reviewed to verify that the pump could achieve the required flow and pressure requirements. Additionally, the team reviewed calculations and drawings to verify that the pump would have sufficient NPSH under all river conditions.

b. Findings

No findings of significance were identified.

.2.1.7 John Deere Emergency Generator

a. Inspection Scope

The team inspected the John Deere Diesel Generator (JDDG) system to verify that it could meet its safety function. The team conducted a walkdown of the JDDG to evaluate the material condition of the equipment and accessibility of components to operators. The team reviewed loading calculations to verify the JDDG had sufficient capability to accept accident loading when used during a Station Blackout Event (SBO) and verified there was adequate margin to maintain power to required equipment. The team also assessed the operating procedures which aligned various busses and breakers to the JDDG to ensure power could be provided to all required equipment.

b. Findings

No findings of significance were identified.

.2.1.8 Emergency Diesel Generator Circuit Breaker, DG-1-1B

a. Inspection Scope

The team inspected the emergency diesel generator (EDG) circuit breaker to verify it could respond to all design basis events. The team conducted a walkdown of the associated switchgear to verify the material condition of the equipment. The team reviewed both inspection and overhaul procedures to verify that appropriate preventive maintenance procedures were being performed. The team reviewed condition reports (CRs) written during the last five years for all 4KV output breakers to assess potential common breaker failures and corrective actions taken to address discrepancies. The EDG maximum full load current was assessed to ensure the EDG could provide required power during design basis events. The maximum short circuit current was reviewed to ensure equipment protection was provided. Additionally, vendor schematics of the EDG breaker closing and tripping circuits as well as the appropriate control wiring diagrams were compared with surveillance procedures to verify that all circuitry was being properly tested. The team reviewed the control circuit voltage drop study to verify that at minimum battery conditions there was sufficient voltage available at the closing coil of output breaker.

b. Findings

No findings of significance were identified.

.2.1.9 Emergency Core Cooling System (ECCS) Analog Trip System

a. Inspection Scope

The team inspected portions of the ECCS Analog Trip System to verify the system would be able to actuate ECCS equipment during design basis events. The team reviewed control wiring diagrams including transmitters, master and slave trip units, and auxiliary relays to ensure that contacts would operate in the correct combination to actuate components of the RHR and HPCI systems. The team assessed drywell high pressure and reactor vessel water level data sheets and HPCI actuation logic functional/calibration test data sheets to verify appropriate testing acceptance criteria had been established, results were within acceptable ranges and there were no repetitive degradations or failures.

b. Findings

Introduction: The team identified a Green NCV of 10CFR50, Appendix R (App R), General Requirements for failure to create and implement surveillance procedures to ensure that App R equipment is operable. Entergy failed to create adequate surveillance procedure for an App R power supply following the installation of the circuit.

Description: The team reviewed modification VYDC 2000-030 - Replacement of 24 Vdc ECCS batteries with DC Power Supplies that replaced batteries and associated charger with three power converters. The power supplies are used to provide safety related 24 Vdc power to Division I and II distribution panels. The modification installed a Division I, II and a designated App R converter into the system. The Division I and II converters provide the normal to feed the 24 Vdc distribution panels. The App R converter was installed to supply power to the Division II panel in the event of a postulated design basis fire. The Division II train supplies power to several App R safe shutdown components including ECCS Analog Trip Cabinets, Reactor Core Isolation Cooling system logic and the Alternate Shutdown Panel.

The modification required operators to open breakers and connect power cables to the App R power supply to re-power the Division II distribution bus which resulted in a long App R fire time line. To reduce the time-line, the licensee implemented a second modification, ER 04-1337 - 24 VDC Power Distribution Improvements. This modification permanently connected the Division II and App R converters to the B distribution panel and installed isolation diodes to provide electrical separation between the two power supplies. The normal alignment of the power supplies set the output voltage of the Division II power supply higher than that of the App R power supply. This ensured the credited and tested safety related power supply supplies the Division II equipment. If the Division II power supply failed, the App R power supply would automatically supply the distribution panels. The team determined that because of this configuration it would not be apparent if power was available from the App R power supply. The team noted that post modification testing of the modification included testing of the isolation diodes and associated wiring to verify proper installation; however, a periodic surveillance test had not been created to verify the circuit from the App R power supply was operable after the equipment was placed in service. Entergy intends to create a new surveillance test to correct the omission.

Analysis: The performance issue associated with this finding was that the licensee failed to create a surveillance procedure to ensure that components are operable as required by App R, Part 2 - General Requirements. Additionally, Entergy's procedure related to the modification process included a requirement to verify that regulatory requirements are met for testing and, therefore, testing to ensure the circuit was operable should have been identified prior to completion of the modification. The issue is more than minor because if left uncorrected it could lead to a more significant safety concern and is related to equipment performance attribute of the Mitigating System Cornerstone to ensure the availability of equipment. The issue was evaluated in accordance with NRC Manual Chapter 0609, Appendix F Fire SDP. The finding category was determined to be post-fire safety system and because the circuit was tested in 2005 as part of the post maintenance test for the modification, the issue was considered to have a low degradation significance therefore the issue screened to green. This finding has a crosscutting aspect in Human Performance Resources - ensure equipment, procedures are available - because the Entergy staff failed follow procedures that were designed to ensure testing requirements were established.

Enforcement: 10CFR50, Appendix R, II.C.7 requires, in part, that surveillance procedures shall be established to ensure that components are operable. Contrary to this requirement, following installation of ER 04-1337, Entergy did not implement an adequate surveillance of the Appendix R power circuit to ensure its availability. However because the finding is considered of very low safety significance and Entergy has entered the issue into their corrective action program (CR-06-02454) it is being considered a non-cited violation, consistent with Section VI.A of the NRC Enforcement Policy. NCV 05000271/2006007-01, Inadequate Appendix R Power Supply Surveillance Test.

2.1.10 Reactor Recirculation Unit, RRU-7

a. Inspection Scope

The team inspected the northeast corner room reactor recirculation unit (RRU-7) to verify the capability of the unit to handle design basis heat loads. The team reviewed design, thermal calculations and current condition to assess whether it was capable of removing sufficient heat from the essential ECCS equipment during normal and accident conditions. Thermal calculations were reviewed to determine the temperature rise in the North East corner ECCS room during design basis events. Air velocity data, sensitivity studies, fouling factors and thermal performance test data were evaluated to verify that the design produced sufficient cooling to keep the room temperature below the room equipment qualification limits during all design basis events. Emergency operating procedures were reviewed to ensure the system could be operated in accordance with design assumptions. A walkdown was performed to inspect the condition and layout of the equipment and instrumentation in the corner room.

b. Findings

No findings of significance were identified.

.2.1.11 Service Water Strainer, S-3-1A

a. Inspection Scope

The team inspected the 'A' service water (SW) strainer to verify it would operate as required during design basis events. The team conducted plant walkdowns, interviewed the system and design engineers for this system, as well as plant operators to assess the material condition of the strainer. The team reviewed the design of the strainer, the mesh size of the strainer elements, the set points of the differential pressure instruments associated with the strainer, the operating procedures associated with the strainer, and the capability to manually operate the strainer backwash system in the event of a loss of normal power to verify the SW strainer was capable of preventing clogging of downstream equipment while providing the required flow under the most limiting accident and transient conditions. In addition, the team verified that the strainer pressure drops and blowdown rates assumed in the service water system flow analyses were bounding.

b. Findings

Introduction: The team identified a Green non-cited violation (NCV) for failure to establish an adequate procedure in accordance with Technical Specification 6.4 - Procedures - that effectively addressed reduced service water (SW) flow or loss of service water flow conditions. Specifically, Entergy's Loss of Service Water (LOSW) procedure permits operators to bypass the SW strainers and potentially compromise downstream safety-related components during plugged strainer events.

Description: SW strainers, S-3-1A/1B are two full flow, safety-related strainers designed to allow full flow of service water to components, including the emergency diesel generators, residual heat removal (RHR) heat exchangers, and RHR SW pump motor cooling, while protecting these components by removing any debris ingested from the river by the SW pumps. The strainers are designed to back-flush debris collected on the strainer back to the river when pressure across the strainer increases. A non-safety related motor that rotates the flushing mechanism and a non-safety related valve that opens to allow discharge flow back to the river provides the back-flush feature.

The team reviewed the ability of the site to cope with plugged strainers that involved a loss of normal power and high debris loading in the river. During a loss of normal power, the strainer backwash and rotation capabilities are lost and the system is vulnerable to common-mode plugging of the strainers due to river debris conditions which would cause degraded or loss of SW flow. ON-3148, Loss of Service Water, governs operator actions during high strainer differential pressure and reduced SW flow events. When an alarm in the control room annunciates at 6 psid across the SW strainer, operators would enter the LOSW procedure as directed by the alarm response sheet. Excluding the operation of the strainer backwash system, the procedure does not direct operator actions to address plugged strainers until the differential pressure across the strainers reaches 10 psid. At this point, the procedure cautions operators on the potential adverse effects of bypassing strainers and then continues to direct operators to consider bypassing the strainers. No procedural guidance was given providing direction to the operators on how to evaluate this condition and there is no engineering information available to assist in their decision. When it becomes apparent that service water cannot be restored, the procedure directs the operators to shift to alternate cooling system (ACS).

The team, through interviews and documentation, questioned whether Entergy had evaluated or analyzed the potential downstream effects from transported silt and debris to safety-related heat exchangers, valves, and pumps. The team's review revealed that the impact to the plant by bypassing strainer debris had not been fully analyzed. The team concluded that bypassed strainer debris could challenge the reliability of downstream safety components. Furthermore, the team questioned the adequacy of this procedure because if the strainer was bypassed debris could potentially clog downstream components which would result in both the SW system and ACS, the alternate design basis ultimate heat sink, becoming unavailable.

The station recognized the potential vulnerability of bypassed debris in 1993 and again in 1998. A 1993 station engineering evaluation assessed the impacts of non-safety power sources to the strainer back-flush system. Several options, to minimize the vulnerability associated with a loss of power and debris plugging event, were recommended but they were not implemented. In 1998, Entergy updated the LOSW procedure by adding cautionary statements to the procedure about the potential for debris clogging downstream components if the strainer bypass valve was opened. Entergy is currently evaluating design and procedural improvements to provide for backwash capability for all events.

Analysis: The performance deficiency associated with this finding is that Entergy did not establish adequate procedural guidance in the LOSW procedure to address plugged SW strainer conditions. The finding is more than minor because it is associated with the procedure quality attribute of the Mitigating System cornerstone and affects its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Inspectors assessed this finding in accordance with NRC Manual Chapter 0609, Appendix A, Attachment 1, "Significance Determination Process (SDP) for Reactor Inspection Findings for At-Power Situations," and determined that it was of very low safety significance (Green) since it did not result in a loss of any safety system function and was not risk significant due to external events. Specifically, the team did not identify any instances where the station had bypassed strainers, admitted debris downstream, and challenged safety systems. Therefore, using the Phase 1 SDP, this issue screened as a Green finding.

Enforcement: Vermont Yankee Technical Specification 6.4, Procedures, requires that written procedures be established, implemented and maintained covering the activities that require actions be taken to correct specific and foreseen potential malfunctions of systems or components. Entergy procedure OP 3148, Loss of Service Water, directs operator action during loss of service water transients including strainer plugging issues. Contrary to the above, an adequate written procedure directing appropriate actions to address plugged SW strainer issues had not been established. Because the finding was of very low safety significance and has been entered into Entergy's corrective action program, CR 2006-02508, this violation is being treated as a non-cited violation (NCV), consistent with Section VI.A of the NRC Enforcement Policy. NCV 05000271/2006007-02, Inadequate Clogged SW Strainer Procedure.

2.1.12 Service Water Pump, P-7-1D

a. Inspection Scope

The team reviewed the design and performance of 'D' service water pump. The team reviewed various system flow analyses to verify the capability of the pump to provide the required flow under a variety of system configurations used during accident and transient conditions. The team reviewed the results of recent pump surveillance tests to verify that the actual pump performance was bounded by the system analyses, and to verify that there were no unacceptable "strong pump/weak pump" interactions. The team also reviewed condition reports and an operability evaluation to verify the basis for continued operability was acceptable. In addition, the team interviewed the system and design engineers for this system.

b. Findings

No findings of significance were identified.

2.1.13 HPCI Motor Operated Valve, V23-17

a. Inspection Scope

The team inspected the HPCI pump suction valve to verify that it was capable of meeting its design basis requirements. The inspection consisted of a walkdown of the equipment, interviews with the motor operated valve (MOV) engineers, and a review of the valve documentation. IST tests were reviewed to verify that the stroke time acceptance criteria were in accordance with the UFSAR, DBD, and accident analysis assumptions. The team reviewed dynamic test results and calculations to verify that thrust and torque limits, and actuator settings, were correct. Periodic test results were reviewed to determine if there were any adverse trends. The team reviewed the calculations associated with the minimum CST level required to prevent air entrainment and the valve stroke times required to isolate this flow path under accident conditions. The team also reviewed recent surveillance test data to verify the valve stroke times were adequate.

b. Findings

No findings of significance were identified.

2.1.14 <u>HPCI Motor Operated Valve, V23-19</u>

a. <u>Inspection Scope</u>

The team inspected the HPCI pump discharge valve to verify that it was capable of meeting its design basis requirements. The inspection consisted of a walkdown of the equipment, interviews with the motor operated valve (MOV) engineers, and a review of the valve documentation. IST tests were reviewed to verify that the stroke time acceptance criteria were in accordance with the UFSAR, DBD, and accident analysis assumptions. The team reviewed dynamic test results and calculations to verify that thrust and torque limits, and actuator settings, were correct. Periodic test results were reviewed to determine if there were any adverse trends. Additionally, the team reviewed the design to verify that opening this valve would not result in a water hammer condition under accident or transient conditions.

b. <u>Findings</u>

No findings of significance were identified.

2.1.15 <u>HPCI Turbine, TU-44-1A</u>

a. <u>Inspection Scope</u>

The team inspected the HPCI turbine drive and associated instrumentation to verify that it was capable of meeting its design basis requirements. The team conducted a walkdown of the components, and interviewed the system and design engineers to assess the material condition of the pump. The team verified the HPCI turbine could provide the required power under the most limiting accident and transient conditions. The team reviewed the set points and supporting analyses for various instrument loops designed to isolate steam to the turbine in the event of a high energy line break in the system to verify that the worst case conditions were bounded by the system analyses. The review verified the steam flow would be isolated when required, and that these instruments would not cause an inadvertent isolation under accident or transient conditions. The team reviewed the controls associated with automatically starting and operating the HPCI pump to verify proper operation. The team also reviewed condition reports and an operability evaluation associated with this pump to verify its continued operability.

b. <u>Findings</u>

<u>Introduction:</u> The team identified a Green non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for failure to take actions to correct a condition adverse to quality. Specifically, plant personnel failed to correct significant flow fluctuations caused by the Terry turbine flow/speed controllers for both the HPCI and RCIC systems.

Description: On July 25, 2005, a plant trip occurred resulting in the automatic initiation of both the HPCI and RCIC systems. Both systems started successfully and provided flow to the reactor vessel; however, post trip analysis showed the systems experienced significant flow variations while in automatic operation. Entergy evaluated data from the plant computer and determined that the RCIC pump flow had varied from less than 100 gpm to greater than 500 gpm while in automatic mode. The system set point was 400 gpm. The actual range of the RCIC flow variations could not be determined due to the range of the instrumentation used. The licensee's evaluation of the HPCI data indicated that the HPCI flow fluctuated between about 1500 gpm and 3000 gpm while in automatic mode and after the controller set point was reduced to approximately 2200 gpm. The injection flow rates at the beginning of the event were not available due to a plant computer malfunction. The fluctuations continued until the HPCI pump controller was put in manual mode. The team noted that plant personnel concluded that neither the HPCI nor the RCIC systems were degraded as a result of the fluctuations. The licensee's engineering personnel concluded that the RCIC flow controller should be tuned as part of the fall 2005 refueling outage; however, this action was later cancelled because the licensee believed the system was not degraded. Additionally, the team determined no corrective actions had been established to resolve the HPCI flow oscillations.

During the 2005 refueling outage, a visual inspection of three containment isolation check valves installed in the steam discharge piping from the HPCI and RCIC turbine drives found them damaged (seat leakage). Condition reports were initiated and corrective actions were performed to repair the valves. The licensee concluded that flow fluctuations contributed to the damage on the RCIC valves but not the HPCI valve. Subsequent to the repairs, no actions were scheduled to tune the HPCI flow controller and the tuning of the RCIC flow controller was scheduled for the beginning of the next refueling outage (18 months later). The team noted that tuning of these systems did not require the plant to be in an outage.

The team questioned the licensee's operabiliy evaluation of the RCIC and HPCI system flow variations and the conclusion that the systems remained operable. The team questioned the ability of the systems to meet the required average HPCI and RCIC flow during transient and accident conditions due to the controller's limit on maximum speed for the turbine. This issue had not been discussed in the operability evaluation. Additionally, the team determined that if the RCIC system was left in automatic it could damage the steam exhaust check valves, and the team questioned Entergy's conclusion that containment remained operable.

Entergy re-performed the Operability Evaluation and concluded that both the HPCI and RCIC systems and turbine exhaust check valves remained operable but were degraded. The evaluation included taking credit for an operator compensatory action to place the Terry turbine controllers in manual if oscillations are observed. This action eliminates the oscillations, restores full flow, and prevents potential damage to the check valves. The licensee is evaluating additional corrective actions.

The team concluded the controller speed limiter would cause the average system flow rate to be less than the required flow as described in the UFSAR but higher than the flow used in the current accident analysis calculations and, therefore, the system was operable because the safety function was retained. Additionally, the team found that the compensatory operator action would eliminate the flow oscillations and therefore, prevent potential damage to the check valves. The team also noted that the check valves were in a closed loop piping system and there was not an open pathway to the environment.

Analysis: The team determined this issue was a performance deficiency because the licensee failed to take action to correct a degraded condition related to the controller circuit for the HPCI and RCIC Terry turbines. In addition, the licensee failed to perform an adequate Operability Evaluation to verify continued operability when the condition was discovered. The finding is greater than minor because it affected the mitigating systems cornerstone objective and aspect as related to the reliability and capability of the HPCI and RCIC systems. In accordance with Inspection Manual Chapter 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations," the inspectors conducted a SDP Phase 1 screening and determined the finding was of very low safety significance (Green) because it did not represent an actual loss of safety function because the average system flow required by the safety analysis was met. This issue has a crosscutting aspect in the area of Problem Identification and Resolution, corrective actions, in that the licensee failed to take appropriate corrective actions to address this safety issue in a timely manner.

Enforcement: 10 CFR 50 Appendix B, Criterion XVI, Corrective Action, requires, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. Contrary to the above, the licensee failed to take effective, timely action to correct a degraded condition that could have affected the function of mitigating systems. Because this violation is of very low safety significance and has been entered into the licensee's corrective action program (condition report CR-VTY-2006-02524), this violation is being treated as a non-cited violation consistent with Section VI.A of the NRC Enforcement Policy. NCV 05000271/2006007-03, Inadequate Corrective Actions for HPCI/RCIC Terry Turbine Controller Flow Oscillations.

2.1.16 HPCI Pump, P-44-1A

a. Inspection Scope

The team inspected the HPCI main and booster pump, and associated support systems to verify the equipment was able to meet its design basis requirements. The team conducted a walkdown of the components, and interviewed the system and design engineers to assess the material condition of the pump. The team reviewed the HPCI system flow analyses to verify the capability of the pump to provide the required flow under the most limiting accident and transient conditions. The team reviewed the results of recent pump surveillance tests to verify that the actual pump performance was bounded by the system analyses. The team reviewed the set points and supporting analyses for various instrument loops designed to isolate the pump suction piping to ensure set points would not preclude operation of the pump during accident conditions.

The team reviewed the controls associated with automatically starting and operating the HPCI pump to verify proper operation. The team also reviewed condition reports and an operability evaluation associated with this pump to verify its continued operability.

B. Findings

No findings of significance were identified.

.2.2 Review of Low Margin Operator Actions (3 samples)

The team performed a risk assessment of expected operator actions, and selected a sample of operator actions for detailed review based upon potential low margin for successful completion of the action. Low margin issues were generally characterized as having one or more of the following attributes:

- Low margin between the time required and time available to perform the actions;
- Complexity of the actions;
- Reliability or redundancy of the components associated with the actions; and
- Procedure or training challenges that may impact the operators' ability to perform the actions.

.2.2.1 Operator aligns John Deere Diesel Generator during Station Blackout

a. Inspection Scope

The team selected the operator actions to manually align the JDDG to supply emergency AC power to Bus 9 - 480 Vac during a station blackout event. These operator actions enable the JDDG to be aligned to supply AC power to Bus 9 and prevent the depletion of safety related batteries during a station blackout. The actions allow station personnel to maintain battery charging and power RHR valves for diesel driven fire pump RPV injection. The VY Human Reliability Analysis assigned a stress level for these actions as high due to the time constraints and environment that occur during an extended station blackout scenario.

In order to evaluate the time required to correctly perform all necessary manual actions, the team interviewed licensed operators, non-licensed operators and training personnel. The team performed field and main control room walkdowns to independently identify operator task complexity. The team evaluated the available time margins to perform the operator actions in order to verify Entergy’s operating and risk model assumptions.

Additionally, applicable procedures were reviewed to ensure they could be performed. Finally, the team observed an auxiliary operator demonstrate the alignment in the field.

b. Findings

No findings of significance were identified.

.2.2.2 Operator initiates alternate containment heat removal and cooling

a. Inspection Scope

The team selected the manual actions associated with the alignment and initiation of alternate cooling when station service water becomes inoperable. Failure of these actions could result in inadequate torus cooling and loss of containment heat removal capability. The VY Human Reliability Analysis assigned a stress level of high with these actions as the procedure would require multiple operators manually operating valves in various locations throughout the reactor building and cooling tower area.

In order to evaluate the time required and accessibility to perform the manual actions, the team interviewed licensed operators, non-licensed operators and training personnel. The team performed field and main control room walkdowns to independently identify operator task complexity. The team evaluated the available time margins to perform the operator actions to verify operating and design basis assumptions were correct; and reviewed the applicable procedures to assess the guidance provided to the operator. The team also observed an auxiliary operator demonstrate the alignment in the field.

b. Findings

No findings of significance were identified.

.2.2.3 Operator aligns Alternate Injection via Diesel Fire Pump; RHR Service Water

a. Inspection Scope

The team selected the manual actions to align alternate injection using the diesel-driven fire pump and using RHR service water. These manual operator actions are related in that they both provide an alternate injection path for water to the reactor pressure vessel (RPV) during events that require RPV make-up due to loss of normal injection systems. Failure of these actions could result in loss of RPV level control and core uncovery. The VY human reliability analysis assigned a stress level with these actions between moderate to high, and a task complexity of moderate.

In order to evaluate the time requirements to perform the manual actions, the team interviewed licensed operators, non-licensed operators and training personnel. The team performed control room and field walkdowns to independently identify operator task complexity. The team evaluated the available time margins to perform the operator actions to verify Entergy's operating and risk model assumptions; and reviewed the applicable procedures to assess the guidance provided to the operator.

b. Findings

No findings of significance were identified.

.3 Review of Industry Operating Experience (OE) and Generic Issues (4 Samples)

a. Inspection Scope

The team reviewed selected OE issues that had occurred at domestic and foreign nuclear facilities for applicability at Vermont Yankee. The team performed an independent applicability review and selected issues with apparent applicability to Vermont Yankee. The team performed a detailed review of the OE issues listed below to verify that VY had appropriately assessed potential applicability to site equipment.

NRC Information Notice (IN) 2000-08 - Inadequate Assessment of the Effect of Differential Temperatures on Safety-Related Pumps

The team reviewed the potential of inadequate engineering design assessment of the effect of differential temperatures on safety-related pumps that could cause pump inoperability. The areas reviewed included potential safety-related pump binding due to thermal expansion, increased bearing temperatures due to bearing housing material and lubricating oil changes, and design inputs in engineering evaluations.

Regulatory Issue Summary (RIS) 2001-015 - Performance of DC-Powered Motor-Operated Valve (MOV) Actuators

The team selected this operating experience as it relates to MOV actuators and to various other OE documents such as Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," GL 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves," and Information Notice 96-48, "Motor-Operated Valve Performance Issues." Industry experience has identified weaknesses in the prediction of motor-actuator performance, and as a result DC-powered MOVs could become incapable of performing their safety functions under design basis conditions. The team assessed the applicability of this issue to VY and Entergy's current methodology to predict motor-actuator performance.

NRC Information Notice 2002-12: Submerged Safety-Related Electrical Cables

The team assessed Entergy's applicability review and disposition of NRC IN 2002-12: Submerged Safety-Related Electrical Cables. The team selected IN 2002-12 due to its potential applicability to safety related underground cables. The team reviewed the underground duct drawings and preventive maintenance procedures.

NRC Information Notice 94-06: Potential Failure of Long-Term Emergency Nitrogen Supply for the Automatic Depressurization System Valves

The team assessed Entergy's applicability review and disposition of NRC IN 94-06. The team selected IN 94-06 due to the possibility of failure of the nitrogen system that supplies control air to the safety relief valves. Specifically, the failure of the Buna-N parts as a result of high temperatures that would exist following a loss of coolant accident could lead to depressurization of the nitrogen system. The team reviewed Entergy's preventive and corrective maintenance programs and corrective actions to deal with possible failure of Buna-N material.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Problem Identification and Resolution

a. Inspection Scope

The team reviewed a sample of problems that were identified by the licensee and entered into the corrective action program. The team reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions related to design or qualification issues. In addition, CRs written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the corrective action system. The specific corrective action documents that were sampled and reviewed by the team are listed in the attachment to this report.

b. Findings

No findings of significance were identified.

4AO6 Meetings, Including Exit

Exit Meeting Summary

On August 17, 2006, the team presented the inspection results to Mr. James Maguire, General Manager - Vermont Yankee Nuclear Power Station, and other members of Entergy's staff. The team verified that no proprietary information is documented in the report.

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel:

W. Maguire	General Manager of Plant Operations
J. Dreyfuss	Director of Engineering
J. Callaghan	Design Engineering, Manager
W. Aho	Operating Experience Coordinator
R. Rusin	Senior System Engineer
P. Johnson	Senior System Engineer
C. Hansen	Component Engineer
M. Ball	Senior System Engineer
J. Devincentis	Licensing Manager

NRC Personnel

B. Cook	Region 1 Senior Risk Analyst
D. Pelton	VY Senior Resident Inspector
B. Sienel	VY Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000271/2006007-01	NCV	Inadequate Appendix R Power Supply Surveillance Test
05000271/2006007-02	NCV	Inadequate Clogged SW Strainer Procedure
05000271/2006007-03	NCV	Inadequate Corrective Actions for HPCI/RCIC Terry Turbine Controller Flow Oscillations

Discussed

None.

LIST OF DOCUMENTS REVIEWED

Calculations

DC-1585, Evaluation of Vermont Yankee Service Water Pumps at High Flow "Off Design" Conditions, Rev. B
VY-RPT-05-00004, VYNPS EPU SBO Coping Analysis Report, Rev. 0
VY-RPT-05-00016, WBS 1.4.4.0 ECCS NPSH EPU Task Report for ER-04-1409, Rev. 0
VY-RPT-05-00051, WBS 1.4.3.1 SW and ACS EPU Task Report for ER-04-1409, Rev. 0
VY-RPT-05-00078, Task T0404 High Pressure Coolant Injection System EPU Task Report for ER-04-1409, Rev. 0
VYC-0808, Core Spray and Residual Heat Removal Pump Net Positive Suction Head Margin Following a Loss of Coolant Accident and an Anticipated Transient Without Scram with Fibrous Debris on the Intake Strainers, Rev. 8
VYC-1181, System Level Review of Residual Heat Removal (RHR) MOVs for Generic Letter 89-10, Rev. 6
VYC-1279F, SW Flow Analysis - LOCA, Seismic, Offsite Power Available, Bus Failure, Rev. 4
VYC-1279G, SW Flow Analysis - LOCA, Seismic, LNP, Single Failure of MOV-10-89A or B, Rev. 0
VYC-1279I, SW Flow Analysis - Safe Shutdown after Tornado, Loss of Offsite Power, Bus Failure, Rev. 0
VYC-1279J, SW Flow Analysis - Deep Basin Back Flow Due to Seismic Line Breaks in Turbine Bldg. & Minimum EDG Flowrates after Common Discharge Hdr Break, Rev. 0
VYC-1322, Part I ECCS Corner Room Heat Up and Sensitivities with Variable RRU Effectiveness, Rev. 1
VYC-1322, ECCS Corner Room Heatup and Sensitivities with Variable RRU Effectiveness, Rev. 2
VYC-1341, RHR Heat Exchanger Performance at Maximum Post-LOCA Pool Temperature, Rev. 0
VYC-1431, Vermont Yankee RHR Heat Exchanger Performance in Shutdown Cooling Mode, Rev. 0
VYC-1735B, Reconciled RELAP4/MOD5 High Pressure Coolant Injection Line Break within Main Steam Tunnel Model and Analysis, Rev. 0
VYC-2045, Residual Heat Removal Heat Exchangers Fouling Factors and Projected Heat Rates for Cycle 21, Rev. 0
VYC-2053, Residual Heat Removal Heat Exchangers E-14-1A and E-14-1B Thermal Performance Test Data Evaluation and Uncertainty Analysis, Rev 0
VYC-1088, Vermont Yankee 4160/480 Volt Short Circuit/Voltage Study, Rev. 3
VYC-1171, Electrical Design Basis Review of Safety Related MOVs for GL 89-10, Rev. 8
VYC-1212, RHR Heat Exchanger Tube Plugging Criteria, Rev. 1
VYC-1258, System Level Review of HPCI MOVs for GL 89-10, Rev. 4
VYC-1279, Service Water System Hydraulic Analysis, Rev. 0

VYC-1279A, Service Water NNS Isolation Setpoint, Rev. 0
VYC-1279B, SW Flow Analysis - Fire Water System Pressurization Line Orifice Failure, Rev. 0
VYC-1279D, SW & RHRSW Flow Analysis for Appendix R RB-1 or RB-3 Fire, Rev. 0
VYC-1279H, Maximizing RHRSW Flow to RHR Heat Exchanger, Rev. 0
VYC-1282, Evaluation of Vermont Yankee Diesel Generator Cooling, Rev. 1
VYC-1328, VY RHR Heat Exchangers Thermal Performance Criteria Development, Rev. 1
VYC-1340A, RRU 7, 8 Thermal Performance, Rev. 0
VYC-1347, Main Steam Tunnel Heatup Calculation, Rev. 0
VYC-1349, 125 V DC Control Circuit Voltage Drop Study-Batteries A1 & B1, Rev. 2
VYC-1670, Vermont yankee LPCI Flow Calculation, Rev. 0
VYC-1771, Low Pressure Coolant Injection Pump Acceptance Values, Rev. 2
VYC-1771, Low Pressure Coolant Injection Pump Acceptance Values, Rev. 0
VYC-1803A, Thermal Performance of Alternate Cooling System for Design Conditions, Rev. 2
VYC-1844, HPCI and RCIC Vortex Height, Rev. 1
VYC-1918, 125VDC and 24VDC ECCS Ground Detection System Analysis, Rev. 0-CCN2
VYC-2153, 125 VDC Battery A1 Electrical System Calculation, Rev. 0
VYC-415, Appendix R/ RCIC, HPCI & ECCS Room Cooling
VYC-462D, High Pressure Coolant Injection Steam Line Areas High Temp. Setpoint, Rev. 0
VYC-488, HPCI Steam Line Low Pressure Trip Loop Accuracy, Rev. 3
VYC-684, RHR Service Water Pump Full Flow Test Acceptance Values, Rev. 0
VYC-687C, HPCI Discharge Flow HI/LOW Trip Indicating Switch Accuracy, Rev. 0
VYC-687E, HPCI Steam Line Break DP Indicating Switch Setpoint Accuracy, Rev. 0
VYC-691, RHR Heat Exchanger DP Monitoring, Rev. 0
VYC-704, HPCI System Control and Indication Loop Accuracy, Rev. 1
VYC-830, Voltage Drop Calculation for VY Distribution Panels DC-1 and DC-2, Rev. 9
VYC-836, Diesel Generator Loading, Rev. 12
VYE-1068, HPCI Hydraulic Calculation, Rev. 0
VYPC 98-008, Component Level Review of High Pressure Coolant Injection (HPCI) MOVs for GL 89-10, Rev. 2
VYPC 98-105, Statistical Analysis of Vermont Yankee Differential Pressure Testing for use in Motor Operated Valve Component Calculations, Rev. 1
VYPC 98-011, Component Level Review of Residual Heat Removal (RHR) MOVs for Generic Letter 89-10, Rev. 2

Surveillance Test Procedures

EN-DC-311, MOV Periodic Verification, Rev. 0
OP 4124, Residual Heat Removal Pump Monthly Surv. Test, Rev. 63, performed 5/3/06, 6/8/06
OP 4120, High Pressure Coolant Injection System Surveillance, performed 2/28/05, 5/18/05, 12/22/05, 2/21/06, and 5/31/06
OP 4124, Residual Heat Removal Pump Cold Shutdown/Refueling Outage Vessel-to-Vessel Test, performed 11/4/05, 10/23/05

OP 4181, Service Water/Alternate Cooling System Surv., performed 4/24/04, 4/25/04, and 11/9/05
OP 4363, HPCI Suction Transfer on Condensate Storage Tank (CST) Low Level Functional Test and CST Level Instrumentation Calibration, Rev. 27
OP 5265, Service Water Component Inspection and Acceptance Criteria, Rev. 5, performed on EDG-1-1A Heat Exchangers 6/26/06, 7/26/06
RP 4394, Process Temperature Monitoring Steam Leak Detection System Functional/Calibration, Rev. 22
ERT.04-1337-02-00, Test Instructions for ER-04-1337, Rev. 1
OP 4105, Eighteen Month Fire Pump Operational Performance and Capacity Check and Diesel Fire Pump Alarm/Shutdown Test, Rev. 14, performed 4/18/06
OP 4124, Residual Heat Removal Loop A Valve Operability Test, performed 5/3/06
OP 4126, Emergency Diesel Generator Surveillance, Rev. 51
OP 4126, DG-1-1A Diesel Generator Surveillance, performed 6/30/06,7/24/06
OP 4100, ECCS Integrated Automatic Initiation Test, Rev. 47
OP 4028, ADS Supply Accumulator Surveillance, performed 11/6/05
OP 5235, Service Water 4KV (Major) Motor Inspection Data, performed 1/31/05
OP 52107, HPCI Overspeed Trip Testing Using the Turbine Control Test Device, Rev. 0
OP 5217, MOV Motor Control Center Testing, Rev. 4
OP 5220, Limitorque Operator PM, Rev. 26
OP 5222, 4KV AC Circuit Breaker Inspection and Testing, Rev.18
OP 5227, 4KV AC Circuit Breaker Overhaul Procedure, Rev. 4
VT-136-A, Visual Examination Report - HD-103A, performed 9/15/90
VYOPF 4181.07, Service Water Manual Valve Exercising - Once per Cycle, Rev. 36
VYOPF 4181.13, RRU 7 & 8 Thermal Performance Test Data Eval., Rev. 35, performed 5/5/05

Completed Work Orders

02-003455-000, T-3-1A Cable Replacement Megger Data, 4/10/04
02-003456-000, T-3-1B Cable Replacement Megger Data, 4/11/04
04-003496-000, Pilot for Safety Relief Valve, 11/12/05
04-003742-000, E-14-1A, Perform RHR Heat Exchanger Cleaning and Baffle Plate Inspection IAW OP 5202 and 5265
04-003832-000, Seismic Supply to ADS Valves Being Installed per 98-405 - 1.5" Stainless Steel Socket Welded, 11/3/05
05-000968-000, Inspect Flood Seals, 5/9/05
05-005096-000, Troubleshoot TCV-104-3, 12/6/05
06-000095-000, Perform RHR Heat Exchanger Cleaning and Baffle Plate Inspection IAW OP 5202 and 5265

Condition Reports

1998-01380	2004-01588	2005-02389	2005-03976
2002-00066	2004-03666	2005-02708	2005-03977
2002-00104	2004-03711	2005-02934	2006-00293
2002-00176	2005-00159	2005-03125	2006-00637
2002-00999	2005-00309	2005-03199	2006-01395
2002-02579	2005-00332	2005-03200	2006-01420
2003-00389	2005-00426	2005-03204	2006-01603
2003-00497	2005-00637	2005-03311	2006-01906
2003-01395	2005-00710	2005-03502	2006-02039
2003-01430	2005-00867	2005-03550	2006-02266*
2003-01848	2005-01106	2005-03563	2006-02307*
2003-02012	2005-01391	2005-03566	2006-02454*
2003-02535	2005-01488	2005-03638	2006-02501*
2003-02550	2005-01588	2005-03717	2006-02508*
2004-00690	2005-01723	2005-03741	2006-02524*
2004-00700	2005-02155	2005-03862	2006-02539*
2004-01304	2005-02171	2005-03887	
2004-01309	2005-02193		

* NRC identified during this inspection

Design Basis Documents

BVY 01-90, Update on Vermont Yankee Generic Letter 89-13 Program Relative to RHR Heat Exchange Testing and Maintenance Practices, 12/11/01
BVY 90-007, Response to Generic Letter 89-13, Service Water System Problems Affecting Safety Related Equipment, 12/2/90
FVY 88-86, Results of Vermont Yankee's Long-Term Resolution Action Items: USNRC Bulletin No. 88-04, 10/14/88
FVY 88-57, Vermont Yankee Response to USNRC Bulletin No. 88-04: Potential Safety-Related Pump Loss, 7/11/88
VY-RPT-05-00076, Task T0310 Residual Heat Removal System, EPU Task Report for ER-04-1409, Rev. 0
VYC-2068, Final Summary of USI A-46 Outlier Resolution, Rev. 0
ADS, Design Basis Document for Automatic Depressurization System, Rev. 0
EE, Topical Design Basis Document for External Events, Rev. 2
HPCI, Design Basis Document for High Pressure Coolant Injection System, Rev. 3
IF, Topical Design Basis Document for Internal Flooding, Rev. 8
NRC Letter NVY 85-8, Technical Specification Amendment No. 85, ½3/85
RCIC, Design Basis Document for Rector Core Isolation Cooling System, Rev. 3
RHR, Residual Heat Removal System Design Basis Document, Rev. 4
Vermont Yankee Updated Final Safety Analysis Report
VY-RPT-05-00028, Task T0407 ECCS-LOCA SAFER/GESTR EPU Task Report for ER-04-1409, Rev. 0

Drawings

02-113-0005-4, Limitorque Valve Operator, Rev. 1
2F-1214, HPCI Pump Assembly, 10/1/68
30969, Service Water Automatic Strainer, 2/4/69
5920-11863- Sht. 2, RRU7 and 8 Coil Replacement
5920-11864 - Sht. 1, COIL ASSY, Water,
5920-3263, Diesel Driven Vertical Fire Pump P-40-1A, Rev. 2
5920-3992, Emergency Diesel Generator Engine Control
B191301, Sht. 1441, HPCI Pump Discharge Valve V23-20, Rev. 18
B191301, Sht. 860-1, ECCS Analog Trip Div 1, Rev. 9
B191301, Sht. 1455, Control Wiring Diagram HPCI Logic System (SH. 4), Rev. 21
B191301, Sht. 328 and 328A, Diesel Generator 1B Circuit Breaker
B191301, Sht. 1449, Control Wiring Diagram HPCI Logic System (SH. 1), Rev. 7
B191301, Sht. 748, Control Wiring Diagram Steam Leak Detection System, Rev. 5
B191301, Sht. 1440, HPCI Pump Discharge Valve V23-19, Rev. 16
B191301, Sht. 1438, HPCI Pump Suction from Cond. Storage Tank Valve V23-17, Rev.13
B191301, Sht. 1450, Control Wiring Diagram HPCI Logic System (SH. 2), Rev. 23
B191301, Sht. 861-2 ECCS Analog Trip Div 1, Rev. 10
B191301, Sht. 1452, Control Wiring Diagram HPCI System Instrumentation, Rev. 15
B191301, Sht. 1451, Control Wiring Diagram HPCI Logic System (SH. 3), Rev. 29
B191301, Sht. 749, Control Wiring Diagram Steam Leak Detection System, Rev. 7
B191301, Sht. 1442, Control Wiring Diagram HPCI Minimum Flow Bypass to Supp Chamber Valve V23-25, Rev. 13
G191159, Sht. 6, Flow Diagram - AOGCCW, Rev. 9
G191159, Sht. 1, Flow Diagram Service Water System, Rev. 73
G191159, Sht. 2, Flow Diagram Service Water System, Rev. 87
G191159, Sht. 3, Flow Diagram - RCW Cooling Water System, Rev. 38
G191159, Sht. 4, Flow Diagram - TCW Cooling Water System, Rev. 35
G191159, Sht. 5, Flow Diagram - Recirculation Pump Cooling Water System, Rev. 16
G191160, Sht. 3, Flow Diagram Instrument Air System, Rev. 30
G191169, Sht. 2, Flow Diagram -High Pressure Coolant Injection System, Rev. 43
G191169, Sht. 1, Flow Diagram -High Pressure Coolant Injection System, Rev. 48
G191172, Flow Diagram Residual Heat Removal System, Rev. 66
G191265, Sht. 3 of 6, Reactor Building Instrument Arrangement, Rev. 24
G191297, Analog Trip System 24 VDC One Line Diagram, Rev. 21
G191301, Sht. 1438, Control Wiring Diagram HPCI Pump Suction from Cond. Stg. Tk. V23-17, Rev. 13
G191301, Sht. 1440, Control Wiring Diagram HPCI Pump Discharge Valve V23-19, Rev. 17
G191372, Sht. 2, 125 VDC One Line Diagram, Rev. 24
G191372, Sht. 1, 125 VDC One Line Diagram, Rev. 65
G191372, Sht. 3, 125 VDC One Line Diagram, Rev. 17
G191384, Sht. 1, Yard Duct Runs and Ground Site Plan, Rev. 42

G191443, Site Plan Grading & Drainage, Rev. 40
G191662, Turbine Building Ground Floor Plan SHH Plumbing & Drainage, Rev. 17
PD-42102, Edward Flite-Flow Stop Valve, Rev. 4
SK-691-–0359, 18KXH - 2 Stage DWT, Rev. 1

Miscellaneous

AOI-02-190, Auxiliary Operator Training Program - John Deere Diesel Generator, Control Room Logs: 08/01/06 - 08/15/06
CR 2005-2209 Investigation Report, Erratic Indicated RCIC Flow
E-mail, M. Selling to B. Naeck: Structural Walkdown of the HPCI and RCIC Systems, 7/29/05
E125, VY Preventative Maintenance Basis, Rev. 3
E126, VY Preventative Maintenance Basis, Rev. 9
EDG System Health Report, Q1-2006
ER 05-0139, Engineering Request Evaluation of HPCI RPM vs. Discharge Pressure, 2/10/05
ER 04-0572, Engineering Request TBCCW Temperature Control Valve Replacement, 2/13/04
Event Report 95-0608
Exchanger Specification Sheet for Residual Heat Exchanger, 10/11/76
Fire Protection System Health Report, Q1-2006
Fire Protection System Health Report, Q2-2006
GE Spec. No. 21A5840AJ, Auxiliary Steam Turbine Drives, Rev. 1
Health Report, HPCI System, 2nd Quarter 2006
John Deere Diesel Training Slides, 07/25/06
JPM-20007, Cross Connect the Fire and Service Water Systems, Rev. 8
JPM-20019, Perform Alternate Reactor Injection using the A RHR SW Pump, Rev. 10
JPM-20020, Perform Alternate Reactor Injection using the Fire System to RHR, Rev. 8
LOT-00-276, Licensed Operator Training Program - Service Water, Rev. 21
LOT-00-206, Licensed Operator Training - High Pressure Coolant Injection, Rev. 26
Memorandum, J. Duffy to J. Pappas: EDCR 93-405 Modifications to Non-Seismic Branch Lines of the Service Water System, 11/1/93
NRC IN 1994-06, Potential Failure of Long-Term Emergency Nitrogen Supply for the Automatic Depressurization System Valves, ½8/94
NRC IN 1997-78, Crediting of Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response times
NRC IN 2006-17, Recent Operating Experience of Service Water Systems Due to External Conditions, 07/31/06
NRC IN 2002-12, Submerged Safety-Related Electrical Cables, 3/21/02
NRC IN 2000-08, Inadequate Assessment of the Effect of Differential Temperatures of Safety-Related Pumps, 5/15/00
Online TEAR, Training Enhancement, 2/13/06
OP2120 Procedure Change Recommendation, HPCI Ops, 2/15/06
OP2121 Procedure Change Recommendation, RCIC Ops, 2/15/06
Operations Memorandum, SER9613_02 Closure, 02/27/98

PD04769, Integrated Technologies, Inc. Report - Record of Eddy Current Inspection of 1A Diesel Generator Heat Exchanger (DG-1-1A), performed 6/27/06
Post Trip Report 2005-01, Trip Date 7/25/05
Pump Curve T-30040, HPCI Pump 4000 rpm Byron Jackson, 10/9/68
Pump Curve T-29994, HPCI Pump 2000 rpm Byron Jackson, 9/30/68
Pump Curve 24321.5, RCIC Pump Bingham Pump Co., 7/26/67
Record of Eddy Current Inspection of Residual Heat Removal (RHR) Heat Exchanger E-14-1A and E-14-1B, performed 11/99
Report on the Technical Justification for Continued Long-Term Use of Existing RHR Heat Exchangers E-14-1A and E-14-1B, 6/1/00
RF25-173, Scope Management Review Form - Tune Proportional Band and Reset of RCIC Flow Controller, 8/25/05
RHR System Health Report, Q1-2006
RHRSW SSC Performance History, 08/01/03 - 07/31/06
RIS 2001-15, Performance of DC-Powered Motor-Operated Valve Actuators, 8/1/01
SPUCSF-003, Uncertainty Calculation Screening Form PS-23-84-1, 4/17/00
SPUCSF-052, Uncertainty Calculation Screening Form PS-23-97A and B, 4/5/01
TE-2002-004, RHR Performance Characteristics, Rev. 0
TE-2003-017, OPL-4 and OPL-5 Input Preparation for EPU/MELLA+, Rev.0
TE-2003-094, Qualification of RHR and CS Pump Seals for AST, EPU and MELLA+, Rev. 1
Topical Document - External Events, Rev. 2
TPE 28600501, Operate Diesel Fire Pump Manually, Rev. 19
TPE 29879001, Manual Startup and Shutdown of John Deere Diesel Generator, Rev. 19
TPE 20071005, Alternate Injection using Fire System to RHR, Rev. 19
TPE 27670204, Cross Connect Fire and Service Water, Rev. 19
TPE 27670100, Alternate Cooling System Startup and Shutdown, Rev. 19
Vermont Yankee - Human Reliability Analysis Update, June 2000
Vermont Yankee PSTG-EOP Differences, Rev. 20
VY E-plan Drill Report June 21,2006
VY-0008, Service Water Automatic Water Strainer, Rev. 2
VY-2006-005, On-Site Safety Review Committee Meeting Minutes, 2/7/06
VY-2006-030, On-Site Safety Review Committee Meeting Minutes, 7/6/06
VYEM No. 0120, HPCI Turbine Operation and Maintenance Manual, Rev. 2
VYS 151/93, NNS Power in the SW Intake Structure, 11/09/93
VYS 141/95, V10-27A&B Stoke Length memo, 12/29/95

Modifications

EDCR 98-405, Drywell Nitrogen Supply Modifications, 4/29/99
ER 04-1337, 24 VDC Power Distribution Improvements, Rev. 1
VYDC # 2000-028, Main Station Battery A and B Cell Replacement
VYDC # 2000-030, Replacement of 24 VDC ECCS Batteries with DC Power Supplies

Operations Procedures

AP 6041, Vermont Yankee Engineering Evaluations of MOV Dynamic Testing and Feedback of Results into MOV Component Calculations, Rev. 1
OP-5305, Solenoid Valve Maintenance, Rev. 18
AP 0150, Conduct of Operations and Operator Rounds, Rev. 20
ARS 21003, 5-H-4 Steam Flow, Rev. 6
ARS 21003, 5-H-3 Steam Tunnel Temperature, Rev. 6
ARS 21003, 5-H-5 Steam Pressure, Rev. 6
ARS 21004, 6-A-6 Service Water, Rev. 3
DP 4107, EOP/Alternate Shutdown Tools and Supplies Surveillance, Rev. 6
EN-DC-128, Fire Protection Impact Reviews, Rev. 0
EN-DC-141, Design Inputs, Rev. 0
EN-LI-100, Process Applicability Determination, Rev. 1
EN-OE-100, Operating Experience Program, Rev. 2
ENN-DC-115, ER Response Development, Rev. 6
ENN-DC-138, Technical Evaluations of Components and Replacement Items, Rev. 5
ENN-DC-331, MOV Program, Rev. 0
EOP 1, RPV Control, Rev. 3
EOP 3, Primary Containment Control, Rev. 4
EOP 4, Secondary Containment Control, Rev. 2
ERT.04-1337-02-00, Test Instructions for ER-04-1337, Rev. 1
NE 8064, Non-Code Visual Examination Methods as Good Maintenance Practice, Rev. 2
OE 3107, Appendix M, Alternate Injection using Fire System to RHR, Rev. 17
OE 3107, Appendix L, Alternate Injection using SW/RHRSW System, Rev. 17
OE 3107, Appendix II, Bypassing HPCI Group VI High Steam Tunnel/Steam Line Space Temperature Isolation Signals, Rev. 17
ON 3148, Loss of Service Water, Rev. 12
OP 4181, Service Water/Alternate Cooling System Surveillance, Rev. 36
OP 5227, 4KV AC Circuit Breaker Overhaul Procedure, Rev. 4
OP 4127, John Deere Diesel Generator Surveillance, Rev. 9
OP 4126, Emergency Diesel Generator Surveillance, Rev. 51
OP 4100, ECCS Integrated Automatic Initiation Test, Rev. 47
OP 2181, Service Water/Alternate Cooling Operating Procedure, Rev. 107
OP 5222, 4KV AC Circuit Breaker Inspection and Testing, Rev.18
OP 5202, Maintenance/Inspection of Heat Exchangers, Pressure Vessels and Tanks, Rev. 15
OP 2120, High Pressure Coolant Injection System, Rev. 27
OP-0150, Auxiliary Operator Round Sheet Reactor Building, Rev. 168
OP-2119, Nitrogen Supply System, Rev. 14
OP-2191, Containment Air System, Rev. 21
OP-3127, Natural Phenomena, Rev. 17
OT 3111, High Drywell Pressure, Rev. 16
OT 3100, Reactor Scram, Rev. 8
OT 3122, Loss of Normal Power, Rev. 21
STP 96-001, In-Situ Differential Pressure Testing of Valves RHR-25A and RHR-27A, Rev. 0

LIST OF ACRONYMS

AC	Alternating Current
ACS	Alternate Cooling System
App	Appendix
CR	Condition Report
DBD	Design Basis Documents
DC	Direct Current
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
GE	General Electric
GL	Generic Letter
HPCI	High Pressure Coolant Injection
IN	Information Notice
IST	In-service Testing
JDDG	John Deere Diesel Generator
LPCI	Low Pressure Coolant Injection
LOCA	Loss of Coolant Accident
LOSW	Loss of Service Water
MOV	Motor-Operated Valve
NCV	Non-cited Violation
NPSH	Net Positive Suction Head
NRC	Nuclear Regulator Commission
OE	Operating Experience
PRA	Probabilistic Risk Assessment
RAW	Risk Achievement Worth
RCIC	Reactor Coolant Isolation Cooling
RHR	Residual Heat Removal
RIS	Regulatory Issue Summary
RPV	Reactor Pressure Vessel
RRU	Reactor Recirculation Unit
RRW	Risk Reduction Worth
SBO	Station Black Out
SDP	Significant Determination Process
SW	Service Water
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
Vac	Volts Alternating Current
Vdc	Volts Direct Current
VY	Vermont Yankee