UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BLVD., SUITE 100
KING OF PRUSSIA, PA 19406-2713

May 12, 2014

Mr. Christopher Wamser
Site Vice President
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
Vernon, VT 05354

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - NRC COMPONENT DESIGN BASES INSPECTION REPORT 05000271/2014007

Dear Mr. Wamser:

On April 3, 2014, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Vermont Yankee Nuclear Power Station. The enclosed inspection report documents the inspection results, which were discussed on April 3, 2014, with Mr. V. Fallacara, General Manager Plant Operations, 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 involved field walkdowns, examination of selected procedures, calculations and records, and interviews with station personnel.

This report documents one NRC-identified finding which was of very low safety significance (Green). This finding did not involve a violation of NRC requirements. If you disagree with the cross-cutting aspect assigned to any finding, or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I; and the NRC Resident Inspector at the Vermont Yankee Nuclear Power Station.

In accordance with Title 10 of the *Code of Federal Regulations* (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 the public inspection in the NRC Public Docket 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/

Paul G. Krohn, Chief
Engineering Branch 2
Division of Reactor Safety

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

Enclosure: Inspection Report 05000271/2014007
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ

ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Paul G. Krohn, Chief
Engineering Branch 2
Division of Reactor Safety

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

Enclosure: Inspection Report 05000271/2014007
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ

Distribution w/encl:

W. Dean, RA
D. Lew, DRA
M. Scott, DRP
H. Nieh, DRP
R. Lorson, DRS
J. Trapp, DRS
R. McKinley, DRP
S. Shaffer, DRP
J. DeBoer, DRP
S. Rutenkroger, DRP, SRI
S. Rich, DRP, RI
A. Rancourt, DRP, AA
J. Nick, RI OEDO
RidsNrrPMVermontYankee Resource
RidsNrrDorlLpl1-1 Resource
ROPreports Resource

DOCUMENT NAME: G:\DRS\Engineering Branch 2\Arner\VY 2014007 CDBI.docx
SUNSI Review__PGK___(Initials)
ADAMS ACCESSION NUMBER: ML14133A292

☑ SUNSI Review		☑ Non-Sensitive		☑ Publicly Available	
OFFICE	RI/DRS	RI/DRS	RI/DRP	RI/DRS	
NAME	FArner/FA	WSchmidt/WS	RMcKinley/RM	PKrohn/PK	
DATE	05/08/2014	05/12/2014	05/12/2014	05/ 08/2014	

OFFICIAL RECORD COPY

U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.:	50-271
License No.:	DPR-28
Report No.:	05000271/2014007
Licensee:	Entergy Nuclear Operations, Inc.
Facility:	Vermont Yankee Nuclear Power Station
Location:	Vernon, VT 05354
Dates:	March 17 to April 3, 2014
Inspectors:	F. Arner, Senior Reactor Inspector, Division of Reactor Safety (DRS), Team Leader J. Schoppy, Senior Reactor Inspector, DRS J. Patel, Reactor Inspector, DRS M. Orr, Reactor Inspector, DRS S. Gardner, NRC Electrical Contractor
Approved by:	Paul G. Krohn, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY

IR 05000271/2014007; 3/17/2014 - 4/03/2014; Vermont Yankee Nuclear Power Station; Component Design Bases Inspection.

The report covers the Component Design Bases Inspection conducted by a team of four NRC inspectors and one NRC contractor. One finding of very low risk significance (Green) was identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process (SDP)," dated June 2, 2011. Cross-cutting aspects are determined using IMC 0310, "Aspects Within the Cross-Cutting Areas," dated December 19, 2013. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated July 9, 2013. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

NRC-Identified

Cornerstone: Mitigating Systems

Green. The team identified a finding of very low safety significance (Green), in that Entergy did not ensure correct implementation of their design control process when establishing the capacity requirement for the new Station Blackout (SBO) alternate alternating current (AAC) power source. Specifically, Entergy did not use the latest revision of the SBO load capacity analysis as a design input to the load capacity requirement when verifying the adequacy of the sizing of the new SBO diesel generator (DG). Entergy entered the issue into their corrective action system to evaluate the capability of the SBO DG to support the expected SBO loads and initiated actions to ensure the design analysis assumptions for loading are consistent with the established operational procedures for SBO response.

The finding is more than minor because it is associated with the design control attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. In addition, inspectors reviewed IMC 0612, Appendix E, "Examples of Minor Issues," and found that example 3.j was similar, in that, the team had reasonable doubt of the capability of the SBO DG to operate within its analyzed load rating. Specifically, the most limiting condition with residual heat removal service water (RHRSW) pumps in service had not been accounted for in the SBO DG load rating evaluation. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, "Mitigating Systems Screening Questions," Section A, "Mitigating SSCs and Functionality," the team concluded that this finding was a design deficiency that did not result in the SBO DG losing its functionality. Specifically, the team evaluated decay heat level requirements and determined there was reasonable assurance the SBO DG load would have remained within its design rating. The team determined that this finding had a cross-cutting aspect in the area of Human Performance, Procedure Adherence, because the design control engineering change process procedure was not adequately followed, in that, the increased SBO load associated with a second RHRSW pump was not evaluated and resolved through the design review process. [H.8] (Section 1R21.2.1.4]

Licensee-Identified Violations

No findings were identified.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, Barrier Integrity

1R21 Component Design Bases Inspection (CDBI) (IP 71111.21)

.1 Inspection Sample Selection Process

The team selected risk significant components for review using information contained in the Vermont Yankee Station Probabilistic Risk Assessment (PRA) and the U.S. Nuclear Regulatory Commission's (NRC) Standardized Plant Analysis Risk (SPAR) model. Additionally, the Vermont Yankee Significance Determination Process (SDP) analysis was referenced in the selection of potential components for review. In general, the selection process focused on components that had a Risk Achievement Worth (RAW) factor greater than 1.3 or a Risk Reduction Worth (RRW) factor greater than 1.005. The team also selected components based on previously identified industry operating experience issues and the component's contribution to the large early release frequency (LERF). Additionally, key components related to decay heat removal within the spent fuel pool were selected to ensure their performance was consistent with their design requirements. The CDBI components selected were located within both safety-related and non-safety related systems, and included a variety of components such as pumps, motors, heat exchangers, electrical buses, transformers, and valves.

The team initially compiled a list of components based on the risk factors previously mentioned. Additionally, the team reviewed the previous component design bases inspection reports and excluded those components recently inspected. The team then performed a margin assessment to narrow the focus of the inspection to 14 components and 3 operating experience (OE) samples. One Main Steam Isolation Valve component was selected because of its potential impact for LERF implications. The team's evaluation of possible low design margin components included consideration of original design issues, margin reductions due to modifications and margin reductions identified, as a result of material condition/equipment reliability issues. The assessment also included items such as failed performance test results, corrective action history, repeated maintenance, maintenance rule (a)1 status, operability reviews for degraded conditions, NRC resident inspector insights, system health reports, and industry operating experience. Finally, consideration was given to the uniqueness and complexity of the design and the available defense-in-depth margins.

The team inspection was conducted in accordance with NRC Inspection Procedure 71111.21. This inspection effort included: walkdowns 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 the design and licensing basis. A summary of the reviews performed for each component, operating experience sample, and the specific inspection finding identified are discussed in the subsequent sections of this report. Documents reviewed for this inspection are listed in the Attachment.

.2 Results of Detailed Reviews (14 Samples)

.2.1.1 Station Blackout (SBO) Diesel Generator (Electrical)

a. Inspection Scope

The team inspected the station blackout diesel generator to evaluate whether it was capable of meeting its design basis requirements. The SBO DG and associated 4160 Volt switchgear Bus 13 are designed and installed to be the primary SBO alternate alternating current (AAC) power source, replacing the Vernon Hydro Station as the SBO AAC source. The SBO AAC is required to provide standby power to safety-related 4kV Busses when both the preferred power supply and the emergency diesel generator standby power supply are not available. The team reviewed the SBO load capacity analysis to verify that it was consistent with the actual loading expected per the operating procedural guidance in response to a SBO event. The team reviewed diesel generator protective trips and relay setpoint calculations to assess the adequacy of the generator protection during testing and emergency operations. The team observed a successful start and run of the diesel generator including output to the load banks. The team interviewed design engineers and operators regarding design and operating procedures of the SBO diesel generator. In addition, the team performed a walk-down and visually inspected the physical and material condition of the diesel generator. The team reviewed corrective action documents to verify that Entergy was identifying and addressing any adverse conditions or trends.

b. Findings

Introduction. The team identified a finding of very low safety significance (Green), in that Entergy did not ensure correct implementation of their design control process when establishing the capacity requirement for the new SBO AAC power source. Specifically, Entergy did not use the latest revision of the SBO load capacity analysis as a design input to the load capacity requirement when verifying the adequacy of the sizing of the new SBO diesel generator.

Description. The team noted that prior to September 1, 2013, the Vermont Yankee's SBO AAC power source was the Vernon Hydroelectric Station (VHS) for compliance with 10 CFR 50.63, "Loss of All Alternating Current Power." The VHS was designated as a black-start unit by the Independent System Operator (ISO) New England (ISO-NE). As a result of changes to the ISO-NE system restoration strategy, the contract between ISO-NE and the owner-operator of the VHS for black-start of the VHS expired on September 1, 2013 and the VHS could no longer be credited. Entergy identified and installed a replacement SBO AAC power source to ensure continued compliance with the requirements of 10 CFR 50.63.

Entergy prepared and issued engineering change (EC) 37986 in 2013 to identify a replacement SBO AAC power source. This EC installed a 3000 kW diesel generator (DG) and associated 4160 V switchgear Bus 13 that had the capability to energize either Safeguards Bus 3 or Bus 4 in the event of a SBO. The team noted during the review of

EC 37986, that the latest revision of the calculation of the team determined that this, VYC-1458, “Station Blackout Load Capacity Analysis” was not used as a design input to the load capacity requirement when Entergy sized the new SBO DG. The team noted that EC 37986 section 3.3, “Design Input Consideration,” indicated that the capacity of the replacement SBO AAC source shall be greater than or equal to the expected maximum steady-state SBO load from VYC-1458 of 2762 kW plus any added support/auxiliary loads. Section 3.3 of the EC used a maximum load assumption of 2762 kW that was calculated using Revision 0 of VYC-1458. The team identified that there were two minor calculation changes posted against the Revision 0 of that calculation. These changes were as-built and approved changes which therefore needed to be considered when evaluating the capacity requirement of the new SBO source. The latest minor calculation changes determined that the maximum expected load on the AAC power source during a SBO event would be 3127 kW using assumed loads which would be applied per SBO procedures. The team determined that this exceeded the rating of the new SBO DG of 3000 kW.

The team’s review identified that on February 21, 2007, a minor calculation change to VYC-1458 was approved to incorporate changes required by an Extended Power Uprate (EPU). The EPU SBO analysis determined that in order to eliminate the need to credit containment overpressure for net positive suction heat (NPSH) concerns for pumps taking suction from the suppression pool, when service water temperature is greater than 70° F, two RHRSW pumps running in a loop at greater than 4500 GPM would maintain the suppression pool temperature less than the value required for containment overpressure. Therefore, procedures were changed to add an additional RHRSW pump running in the same train to satisfy the EPU SBO NPSH concerns. This additional load was analyzed in VYC-1458 under the minor calculation change process and added to the expected loading sequence to ensure that adequate margin was still available on the VHS, which was the AAC SBO credited source at that time. This second RHRSW pump added a nominal 272 kW on the SBO AAC power source. The addition of the second RHRSW pump and other changes made during 2007 to the calculation of record resulted in increased loading to 3127 kW on the SBO AAC power source. Previously, the VHS transformer had capacity to provide this increased electrical loading. The cumulative effects of minor calculation changes were evaluated in the latest minor calculation change markup and ensured that there was still margin available on the VHS transformer. However, when the engineering change EC 37986 was prepared for the replacement SBO AAC power source, Entergy did not use the latest minor calculation change markup as a design input in evaluating the capacity requirements for the new source.

The team noted that procedure EN-DC-115, “Engineering Change Process,” provides guidance for the design control process to prepare and process engineering changes to plant related structures, systems, and components (SSCs). Engineering changes were prepared and implemented using guidance provided in this procedure, considering design inputs for use in performing design activities. Additionally, procedure EN-DC-126, “Engineering Calculation Process” was used for preparing and making changes to design calculations to be used as design inputs. Procedure EN-DC-126, step 5.2 [5] (c) states that cumulative effects of engineering changes markups (both pending and

as-built) should be considered whenever preparing a calculation, calculation change, or revision. The team noted that calculation of record VYC-1458 was used as a design input to the SBO AAC EC 37986 per procedural guidance. However, Entergy did not adequately follow their design control process in that they did not use the latest minor calculation change markups as a design input and therefore, Entergy failed to evaluate the cumulative effects of these markups in the SBO AAC engineering change.

In response to this issue, Entergy generated condition report (CR-VTY-2014-01290) and performed an immediate functionality review. This review determined that the SBO DG remained functional at the time of the inspection because the service water temperature was less than 70°F resulting in the second RHRSW pump not being required to be placed in service. Entergy issued a standing order for operations personnel to monitor the loads on the SBO DG for a postulated SBO event. Entergy also initiated planned corrective actions to revise operating procedures and the SBO load calculation of record and to strip loads that are not required for coping with a station blackout event. This included actions to revise the calculation to be consistent with the changes made to the operating procedure. The team reviewed Entergy's functionality determination and proposed corrective actions and found them to be adequate.

Analysis. The team determined that Entergy's failure to implement their design control process was a performance deficiency. Entergy did not adequately follow their design control process in establishing the design input used in SBO EC 37986. Specifically, engineering changes related to load increases to the calculation of record were inconsistent with the newly established AAC power source SBO DG rating. This performance deficiency was more than minor because it was associated with the design control attribute of the mitigating systems cornerstone and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. In addition, this issue was similar to Inspection Manual Chapter (IMC) 0612, Appendix E, Example 3.j, in that, the team had reasonable doubt of the capability of the SBO DG to remain within its analyzed load rating under the most limiting loading conditions, such as when both RHRSW pumps were placed in service. The team performed a risk screening in accordance with IMC 0609, Appendix A, "Significance Determination Process for Findings At-Power," using Exhibit 2, "Mitigating Systems Screening Questions," Section A, "Mitigating SSCs and Functionality." The team determined the finding was of very low safety significance (Green) because it was a design deficiency that did not result in the SBO DG losing its functionality. Specifically, the team evaluated decay heat level requirements and determined that existing procedures provided reasonable assurance that the SBO DG load would have remained within its design rating.

The team determined that this finding had a cross-cutting aspect in the area of Human Performance, Procedure Adherence, because the design control engineering change process procedure was not adequately followed, in that, when the increased SBO load associated with a second RHRSW pump was not evaluated and resolved through the design review process [H.8].

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Specifically, failure to implement the design control process did not impact the capability of the station to cope with the time period between the onset of an SBO and the alignment of the AAC power source. Entergy entered this performance deficiency into their corrective action program (CR-VTY-2014-01290). Because this finding does not involve a violation of regulatory requirements and is of very low safety significance (Green), it is identified as a finding. Entergy took corrective action to ensure the SBO DG remained within its load capacity rating for an SBO event and initiated actions to ensure the SBO load capacity design analysis remains consistent with SBO operational procedures such that the load will be verified to remain within the SBO DG continuous rating. **(FIN 05000271/2014007-01, Inadequate Design Control of SBO Loading Calculation).**

.2.1.2 Standby Fuel Pool Cooling System Pump, P-19-2A

a. Inspection Scope

The team inspected the 2A standby fuel pool cooling (SFPC) pump to evaluate whether it was capable of performing its design basis function to provide adequate cooling flow to transfer spent fuel pool decay heat loads to the service water (SW) system via the 2A SFPC heat exchanger (HX). The team reviewed applicable portions of the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TSs), system design specifications, and drawings to identify the design basis requirements for the pump. The team evaluated whether the pump capacity was sufficient to provide adequate flow through the 2A SFPC HX during postulated design basis events. The team reviewed design calculations to assess available pump net positive suction head (NPSH), worst case pump run-out conditions, and to evaluate the capability of the pump to provide the required system flow.

The team reviewed SFPC pump in-service test (IST) results to determine if the testing was adequate to detect degrading pump performance. Specifically, the team reviewed pump data trends for vibration, pump differential pressure, and flow rate test results to verify acceptance criteria were met and acceptance limits were adequate. The team reviewed SFPC system modifications and changes that potentially impacted SFPC flow and/or system operating characteristics to ensure that Entergy properly evaluated the changes. The team discussed the pump design, operation, and maintenance with the engineering staff to gain an understanding of the performance history and overall component health. The team also performed several walkdowns of accessible areas (including control room instrumentation and associated 480V motor control center) to assess Entergy's configuration control, the material condition (including aging management), operating environment, and potential external hazards associated with SFPC system. The team reviewed the design and maintenance of the instrumentation for the SFP to verify its capacity and reliability to ensure irradiated fuel is maintained within licensing bases requirements to support pump operation. Finally, the team reviewed corrective action documents and system health reports to determine if there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.3 Standby Fuel Pool Cooling System Heat Exchanger, E-19-2A

a. Inspection Scope

The team inspected the 2A SFPC HX to evaluate whether it was capable of performing its design basis function to transfer heat loads from the safety-related SFPC system to the ultimate heat sink (the Connecticut River) via the SW system. The team reviewed applicable portions of the UFSAR, TSs, HX specifications, and drawings to identify the design basis requirements for the 2A SFPC HX. The team verified that Entergy properly translated design inputs into system procedures and tests. The team reviewed completed thermal performance tests, HX internal inspection and eddy current test results, and quarterly IST results to verify HX operability and to ensure that Entergy appropriately addressed potential adverse trends or conditions. The team reviewed the maintenance history, design changes, calculations, design specifications, drawings and surveillance tests to ensure that the HX condition and heat removal capability were consistent with design bases assumptions. The team reviewed associated operating, abnormal, and maintenance procedures to ensure consistency with the licensing and design bases. The team discussed the HX design, operation, and maintenance with the engineering staff to gain an understanding of the performance history and overall component health. The team also performed several walkdowns of accessible areas (including control room instrumentation) to assess Entergy's configuration control, the material condition (including aging management), operating environment, and potential external hazards associated with the 2A SFPC HX system. Finally, the team reviewed corrective action documents and system health reports to determine whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.4 Normal Fuel Pool Cooling System Isolation Valve, V19-220

a. Inspection Scope

The team inspected isolation valve V19-220 to evaluate whether it was capable of performing its design basis function to isolate the normal fuel pool cooling system from the safety-related SFPC system in the event of lowering level in the spent fuel pool. The team reviewed applicable portions of the UFSAR, TSs, valve specifications, and drawings to identify the design basis requirements for this safety-related motor-operated valve (MOV).

The team reviewed the corrective and preventive maintenance history, design changes, condition reports (CR), drawings, and related surveillance testing for the isolation valve to ensure that it was capable of performing its specified function. The team reviewed calculations for valve stem thrust and actuator inputs to ensure that the MOV was capable of operation under the worst-case temperature, pressure, and environmental conditions. The team reviewed periodic MOV diagnostic test results and surveillance test procedures to verify acceptance criteria were met and consistent with the design basis. The team also performed several walkdowns of accessible areas (including control room instrumentation and associated 480V motor control center) to assess Entergy's configuration control, the material condition (including aging management), operating environment, and potential external hazards associated with V19-220. Finally, the team reviewed corrective action documents and system health reports to determine if there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.5 SBO Diesel Switchgear Bus 13

a. Inspection Scope

The team inspected the 4160 V switchgear (Bus 13) to evaluate whether it was capable of meeting its design basis function. Specifically, the team evaluated whether the switchgear and bus bar were capable of transferring supplied power to downstream loads during a station blackout event. The team reviewed the UFSAR, design calculations, and drawings to identify the design basis requirements for the bus. The team reviewed electrical calculations for the system's load flow and voltage drop, short-circuit fault protection, and coordination studies to evaluate the adequacy and appropriateness of design assumptions in the calculations.

The team also reviewed the switchgear protective relay setting calculation to ensure that coordination was adequate for the protection of the SBO diesel generator and connected equipment during postulated short-circuit faults. The team reviewed modification acceptance testing and associated work orders to ensure that adequate testing was performed to demonstrate the functionality of the switchgear and connected equipment. The team reviewed phase rotation check testing to verify proper phasing at the load breaker. Additionally, the team performed a visual inspection of the observable portions of the switchgear to assess the installed configuration, material condition, and environmental condition. Finally, the team reviewed corrective action documents to evaluate whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.6 SBO Diesel Batteries

a. Inspection Scope

The team reviewed the design, testing, and operation of the SBO diesel generator batteries (B-SBO-1, B-SBO-2, and B-SBO-3) to evaluate whether they were capable of performing their design function of providing a reliable source of direct current (DC) power to the diesel generator electric starting motor system, generator controls, and the generator output circuit breaker. The SBO diesel generator battery system consists of two, 24 VDC redundant batteries (B-SBO-2 and B-SBO-3) for the diesel generator starting system, and one 48 VDC battery (B-SBO-1) to provide control power to 4160V switchgear BUS 13 and to operate the diesel generator output breaker. The team evaluated the capability of these batteries to ensure that sufficient capacity existed to start and operate the SBO DG. The team reviewed surveillance test results to ensure that the testing was in accordance with industry standards. The team performed a walk-down of the batteries, battery chargers, and associated DC distribution panels to assess the material condition of the equipment. Finally, a sample of condition reports was reviewed to ensure that Entergy was identifying and properly correcting issues associated with these components.

b. Findings

No findings were identified.

.2.1.7 Reactor Core Isolation Cooling Turbine, TU-2-1-1A

a. Inspection Scope

The team inspected the reactor core isolation cooling (RCIC) turbine to evaluate whether it was capable of meeting its design basis and operational requirements to support pump operation to provide cooling water to the reactor vessel under transient and accident conditions. The inspection included a review of the turbine lubricating oil cooler performance and the turbine governor control system including the inner speed loop and outer flow control loop to ensure the capability to meet design conditions. The team performed a walkdown of the turbine and associated equipment, interviewed system and design engineers, and reviewed the RCIC system health reports to assess the material condition of the components. The team reviewed the TSs, UFSAR, and design bases calculations to determine the capability of the turbine to support the required speed ranges to provide pump flowrates, pressures and operating conditions for both the reactor vessel injection mode and condensate storage tank (CST-to-CST) recirculation mode of operation. The RCIC turbine lubricating oil cooler inspection results and tube plugging limits were reviewed to verify that design basis heat removal requirements were satisfied. Finally, the team reviewed condition reports to determine if issues entered into the corrective action program were appropriately addressed.

b. Findings

No findings were identified.

.2.1.8 Reactor Core Isolation Cooling Pump, P-47-1A

a. Inspection Scope

The team inspected the RCIC pump to evaluate whether it was capable of meeting its design basis and operational requirements to provide cooling water to the reactor vessel under transient and accident conditions. The team evaluated the ability of the RCIC pump to deliver the design and licensing bases flow rates at the maximum assumed reactor vessel backpressure. The NPSH for the RCIC pump was reviewed for maximum flow rates from the RCIC pump suction sources to verify that adequate NPSH margin was available at minimum water levels. The team reviewed full flow testing and IST results to verify that the pump performance bounded the flow requirements in the safety analysis and to determine if Entergy had adequately evaluated the potential for pump degradation. The team performed a walkdown of the pump and interviewed system and design engineers to assess the material condition of the pump. The team reviewed corrective action documents and system health reports to determine whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.9 'B' Residual Heat Removal Pump, P10-1B

a. Inspection Scope

The team inspected the 'B' Residual Heat Removal (RHR) pump, P10-1B, to evaluate whether it was capable of performing its design basis function of providing adequate cooling to restore and maintain reactor vessel level following a postulated loss-of-coolant accident (LOCA) condition. This review included an evaluation of the adequacy of the torus cooling mode of operation during design basis events. The team reviewed applicable portions of the UFSAR, TSs, design calculations, and procedures to identify the pump design basis requirements. The team reviewed calculations to verify that the RHR pump was capable of providing the required flow during accident scenarios and that it would have adequate NPSH margin. The NPSH margin was reviewed for the most challenging system flow conditions expected during accident conditions.

The team reviewed test procedures, acceptance criteria, and recent surveillance test results to verify that pump performance was acceptable for the most limiting design conditions. The team reviewed system operating procedures to evaluate consistency with pump design requirements and pump limitations. Additionally, the team reviewed bearing lubrication oil sample results, and interviewed system and design engineers to determine if required pump/motor lubrication was being performed.

The team also conducted walkdowns of the pump to assess the material condition and to verify the installed configuration was consistent with plant drawings and the design and licensing bases. Finally, the team reviewed condition reports to identify adverse conditions, and to determine whether issues were being identified and properly addressed.

b. Findings

No findings were identified.

.2.1.10 Main Steam Isolation Valves, V2-80A and V2-86A

a. Inspection Scope

The team inspected the inboard and outboard main steam isolation valves (MSIVs) V2-80A and V2-86A to evaluate whether the valves were capable of performing their design basis function. The MSIVs are air operated valves designed for post-LOCA containment isolation to prevent uncontrolled primary coolant release to the environment. Additionally, the MSIVs are designed to automatically close following a rupture in the main steam line and remain closed to establish a leak-tight barrier. The MSIV closing times are used as an input to radioactive offsite dose analyses for design basis accidents. The team reviewed the UFSAR, TS, and the TS Bases to identify the design bases requirements of the valve. The team reviewed drawings, operating procedures and completed maintenance to verify the safety function was maintained. The team reviewed valve testing procedures and stroke time data to verify acceptance criteria were adequate and that performance was not degrading. The team discussed design, operation, and component history with engineering staff to evaluate performance history and overall component health. Finally, the team reviewed corrective action documents and system health reports to verify Entergy was identifying and correcting issues, and to verify there were no adverse valve performance trends.

a. Findings

No findings were identified.

.2.1.11 Station Blackout Diesel Generator – Mechanical, SBO DG

a. Inspection Scope

The team inspected the mechanical aspects of the SBO DG to verify that it was capable of meeting its design basis requirements. The team reviewed the associated design and installation drawings for the SBO DG structure and enclosure to evaluate the load capability and whether adverse environmental conditions could be withstood. The team reviewed the equipment nameplate rating data for the SBO DG for conformance with the design basis. The team reviewed surveillance tests to verify that the SBO DG was capable of achieving design basis requirements during limiting licensing basis conditions and that test acceptance criteria were consistent with these requirements.

The team reviewed the quality and storage requirements of the fuel oil, maintenance requirements for the engine and associated systems, and the operator training plan. The team interviewed design and system engineers to assess the adequacy of the testing and maintenance of the SBO DG. The team conducted walkdowns and visual inspections of the SBO DG and associated support systems to assess the material condition, operating environment, and potential vulnerabilities to external hazards. The team observed start-up and operation of the SBO DG to ensure performance was consistent with established acceptance criteria. Finally, the team reviewed a sample of condition reports to verify Entergy was identifying and properly correcting issues with the SBO DG and to verify there were no adverse trends.

b. Findings

No findings were identified.

.2.1.12 "B' Emergency Diesel Generator (Mechanical), DG-1-1B

a. Inspection Scope

The team inspected the 'B' emergency diesel generator (EDG) (DG-1-1B) mechanical systems to determine if they were capable of supporting their design basis functions. Specifically, the team evaluated whether the mechanical support systems for the EDG would operate as required so that the EDG could provide power to the 4.16 kV electrical bus during operational transients and design basis events. The team selected the EDG engine, the fuel oil and transfer systems, the lubricating oil system, starting air system and jacket water cooling system for an in-depth review. The team reviewed the UFSAR, TSs, design basis documents, vendor documents, and procedures to identify the design basis, maintenance, and operational requirements for the engine and systems. The team also reviewed EDG surveillance test results and operating procedures to ensure that the mechanical support systems were operating as designed and within the vendor design limits. The team reviewed fuel oil consumption calculations to verify TS requirements were adequate to meet design basis loading conditions. The team reviewed lubricating oil sample and chemistry results to assess whether Entergy had performed timely analysis for wear and trending, identified potential adverse trends, and to determine if proper lubrication of system components was being performed. The team reviewed the design specification for the air start system, as well as air start test data and results to verify that the air start system was properly sized and could meet its design function for successive starts. The team reviewed the EDG vendor manual and preventive maintenance (PM) activities to ensure that Entergy maintained an appropriate threshold prior to any adverse impact on engine operation. The team reviewed the post maintenance test run data following the previous major overhaul.

The team conducted several detailed walkdowns of the EDG and support systems (including control room instrumentation) to visually inspect the material condition and to assess the operating environment and potential hazards. The team interviewed design engineers and system operators to evaluate past performance and operation of the

EDG. Finally, the team reviewed corrective action documents and system health reports to evaluate whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.13 Standby Fuel Pool Cooling Subsystem (SFPCS) 'A' Pump Motor

a. Inspection Scope

The team inspected the 'A' SFPCS pump motor to evaluate whether the motor was capable of providing sufficient motive force to the pump to perform its required function. The team reviewed calculations and the UFSAR to determine the requirements for the motor under the most limiting system configuration. During normal operation, cooling is provided by the Normal Spent Fuel Pool cooling system. However, for high spent fuel decay heat load conditions or for design basis accident conditions including a loss of offsite power conditions, the SFPCS can be utilized to maintain pool temperatures within specified limits. The team reviewed the alternating current (AC) electrical power supply to the motor to verify that it would provide sufficient voltage under the UFSAR defined loads, including starting conditions. Specifically, the team reviewed calculations that establish voltage drop, and protection and coordination for the motor power supply and feeder cable to verify that design assumptions have been appropriately translated into design calculations. Additionally, the team interviewed the motor component engineer to identify any known issues with the motor and to determine the basis for the preventive maintenance schedule. Finally, the team performed walkdowns of the pump/motor, including control room instrumentation, to verify that Entergy adequately maintained the material condition of the equipment and configuration control.

b. Findings

No findings were identified.

.2.1.14 "B" Emergency Diesel Generator Control Relays, (Electrical) DG-1-1B

a. Inspection Scope

The team inspected control relays associated with the 'B' EDG to evaluate whether the relays were tested and maintained consistent with their licensing bases requirements. The team reviewed the timing logic for the EDG output breaker to ensure it was consistent with the TS requirements for an actual or simulated loss of offsite power (LOOP) signal in conjunction with a loss-of-coolant-accident (LOCA) signal. The team reviewed the relay logic to ensure a sample of non-critical EDG trip relays are isolated on a loss of voltage signal, depending on the loading of the EDG at the time of the signal. The team reviewed the PM activities for the time delay control relays to ensure they are adequately maintained and replacement strategies meet industry standards.

The team reviewed the UFSAR, design basis documents, selected drawings, maintenance, and test procedures to evaluate whether design basis requirements were met. The team also performed walkdowns and conducted interviews with system engineers to ensure the capability of the relays to perform their design function. The team reviewed corrective action documents and the current system health report to evaluate whether there were any adverse operating trends and to assess Entergy's ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.2 Review of Industry Operating Experience and Generic Issues (3 samples)

The team reviewed selected operating experience (OE) issues for applicability at the Vermont Yankee Nuclear Power Station. The team performed a detailed review of the OE issues listed below to verify that Entergy had appropriately assessed potential applicability to site equipment and initiated corrective actions when necessary.

.2.2.1 NRC Information Notice 2011-03: Nonconservative Criticality Safety Analyses for Fuel

a. Inspection Scope

The team evaluated Entergy's applicability review and disposition of NRC Information Notice (IN) 2011-03. The NRC issued the IN to inform licensees of possible non-conservative technical specifications related to the criticality safety of fuel storage. The team reviewed Entergy's internal corrective action program (CAP) response to IN 2011-03, fuel storage criticality safety analyses, spent fuel pool expansion criticality safety evaluation, and associated License Renewal commitments.

b. Findings

No findings were identified.

.2.2.2 NRC Information Notice 2009-10: Transformer Failure – Recent Operating Experience

a. Inspection Scope

The team reviewed Entergy's evaluation of IN 2009-10, "Transformer Failures – Recent Operating Experience," and the associated corrective action report in order to evaluate Entergy's response to the operating experience. The NRC issued IN 2009-10 to inform licensees about operating experience involving failure of large transformers due to ineffective implementation of the transformer maintenance program. The team verified that Entergy has implemented a fleet wide program for reliability of large transformers. The program included taking actions to classify the criticality of SSCs, improve PM basis documents based on criticality, revising the transformer PM program at each site, and performing a single point failure analysis for large transformers.

b. Findings

No findings were identified.

.2.2.3 Operating Experience Smart Sample FY 2010-01 – Recent Inspection Experience for Components Installed Beyond Vendor Recommended Service Life

a. Inspection Scope

NRC Operating Experience Smart Sample (OPESS) FY 2010-01 provided inspection guidance and inspection findings of components that: (1) failed as a result of exceeding vendor-recommended service life, or (2) failed prior to reaching their recommended service life. The sample is, in part, directly related to NRC IN 2009-26, "Degraded Neutron Absorber in the Spent Fuel Pool Racks". The team reviewed Entergy's evaluation of IN 2009-26 and their associated corrective actions to determine if Vermont Yankee was susceptible to the issues discussed in the notice, and to verify that Entergy appropriately dispositioned the concerns. The team reviewed Energy's application for license renewal which included a commitment to test for neutron absorption as part of the Aging Management Program. The team verified that the Boron-10 Areal Density Gauge for Evaluating Racks (BADGER) testing was included in the Vermont Yankee Aging Management Program and Regulatory Commitment Tracking system. The team reviewed the maintenance schedule and BADGER procedure to verify that the testing was scheduled to be performed consistent with the licensing bases commitments. The OPESS also considered electrical components and electrolytic capacitors as an area of concern. The team reviewed Entergy's process for capacitor replacement and reconditioning. The team performed a walkdown of the electrical and instrumentation and control maintenance shops to observe how electrolytic capacitors are handled and stored. The team interviewed warehouse personnel and discussed specific components and their work orders related to electrolytic capacitor replacement or reconditioning while in storage to verify that the program met industry guidelines.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (IP 71152)

a. Inspection Scope

The team reviewed a sample of problems that Entergy had previously identified and entered into the CAP. The team reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions. In addition, CRs written on issues identified during the inspection were reviewed to verify adequate problem identification and incorporation of the problem into the CAP. The specific corrective action documents that were sampled and reviewed by the team are listed in the Attachment.

b. Findings

No findings were identified.

4OA6 Meetings, including Exit

On April 3, 2014, the team presented the inspection results to Mr. V. Fallacara, General Manager Plant Operations, and other members of your staff. The team verified that none of the information in this report is proprietary.

Attachment: Supplemental Information

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel
J. Boyle, Director of Engineering
H. Breite, SW Program Owner (GL 89-13)
J. Card, Reactor Engineer
R. Congdon, SRO/CRS
D. Drolette, System Engineer (RCIC)
B. Egnew, Licensing Specialist
M. Empey, Fire Protection Engineer
V. Ferrizzi, Senior Reactor Operator, Outage Management Team
N. Jennison, Operations Shift Manager
P. Johnson, Principal Electrical Design
W. Lynch, Principal Mechanical Design
B. Naeck, Sr. Systems Engineer
R. Pinto, System Engineer (SFPC)
A. Robertshaw, Mechanical Design Engineer
B. Sheppard, Programs Engineer
R. Smith, VP, Temp/Strategic Initiatives (Director of SAFSTOR at VY)
T. Stetson, Reactor Engineer

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

05000271/2014007-01	FIN	Inadequate Design Control of SBO Loading Calculation (Section 1R21.2.1.1)

LIST OF DOCUMENTS REVIEWED

Calculations:
0000-0117-0292-R1, Vermont Yankee Nuclear Power Station: Fuel Storage Criticality Safety Analysis of New Fuel Storage Racks, July 2010
32-9170924-003, Vermont Yankee SBO Diesel Generator System Protective Relays Settings, Revision 3
DC-A34600-02, RHR and CS Suction Strainer Vortex/Minimum Submergence, Revision 0
EB852, Design and Seismic Analysis Report with Maximum Thrust Consideration, Revision 0
HI-981978, Criticality Safety Evaluation for Vermont Yankee Spent Fuel Pool Expansion Project, Revision 2

RAL-2729-02-07, Calculation for the Edward Size 16 Figure 1612 JMMNTY Flite Flow MSIV, Revision 1
VYC-18, LPCI System Characteristic Curves, Revision 0
VYC-609, Fuel Pool Cooling Pump NPSH at 212 □F, Revision 0
VYC-750, NPSH Available for Proposed New Fuel Pool Cooling Pumps, Revision 0
VYC-808, Core Spray and RHR Pump NPSH Margin following Loss of Coolant Accident and an ATWS with Fibrous Debris on the Intake Strainers, Revision 8
VYC-836, Diesel Generator Loading, Revision 15
VYC-870, Fuel Pool Cooling to Heat Exchangers (E-19-2A & 2B), Revision 2
VYC-886, Station Blackout Documentation Analysis, Revision 2
VYC-0967, Main Steam Line High Flow/Bypass Trip Review, Revision 5
VYC-1282, Evaluation of Vermont Yankee Diesel Generator Cooling, Revision 1
VYC-1282A, Evaluation of Diesel Generator Service Water Flow Requirements, Revision 0
VYC-1404, Emergency Diesel Generator Fuel Oil Usage and Storage Capacity, Revision 2
VYC-1458, Station Blackout Load Capacity Analysis, Revision 0
VYC-1512, Station Blackout Voltage Drop and Short Circuit Study, Revision 2
VYC-1670, LPCI Flow Calculation, Revision 0
VYC-1717, Emergency Diesel Generator Starting Air System Capacity Calculation, Revision 1
VYC-1726, RCIC Pump Test Acceptance Criteria, Revision 1
VYC-1753, Assessment of Heat Removal Capability of Residual Heat Removal and Standby and Normal Fuel Pool Cooling Systems at Various Service Water and Fuel Pool Temperatures, Revision 1
VYC-1840, Time for Operator Response to a Loss of Fuel Pool Level, Revision 1
VYC-1844, HPCI and RCIC Vortex Height, Revision 1
VYC-1854, Determination of Ampacity for Power Cables for the AC Auxiliary Power Distribution System, Revision 1
VYC-2069, Re-Evaluation of Standby Fuel Pool Cooling Heat Exchangers Design Basis, Revision 0
VYC-2092, Standby Fuel Pool Cooling Heat Exchangers Fouling Factors and Projected Heat Rates for Cycle 21, Revision 0
VYC-2148, Pipe Stress Analysis for the Cross Tie Between Alternate Cooling and Standby Fuel Pool Cooling, Revision 0
VYC-2164, Spent Fuel Pool Decay Heat Calculation for VY, Revision 1
VYC-2170, Time to Boil Cases for VY, Revision 1
VYC-3147, HPCI and RCIC Steam Pot Drain Line Isolation Valve, Revision 0
VYDC 2000-016, Standby Fuel Pool Cooling Heat Exchangers Design Tube Plugging, Revision 0
VY-RPT-05-00004, VYNPS EPU SBO Coping Analysis Report, Revision 0
VYS-040, Specification for Protection and Coordination of Electrical Systems, Revision 4

Completed Surveillance/Preventive Maintenance and Modification Acceptance Testing:
ECT-37986-01, SBO Diesel Generator Timed Start Test, performed 8/29/13
ECT-37986-02, SBO Diesel Generator Timed Start Test, performed 8/27/13
EN-MA-134, RHR Motor P-10-1B Off-Line Motor Testing, performed 1/24/12
EN-MA-135, RHR Motor P-10-1B 1.5 YR On-Line Motor Electrical Testing, performed 7/26/13

OP 4113.02, Quarterly MSIV Full Closure Timing and RPS Relay Actuation Functional Test, performed 1/6/14
OP-4100, ECCS Integrated Test, performed 3/30/13
OP-4121, RCIC Injection Check Valve IST, performed 3/10/13
OPSP-SBO-10067-07, Station Blackout Diesel Generator Local Start Surveillance (Once Per Operating Cycle), performed 1/30/14
OPST-EDG-4126-02B, Monthly B EDG Slow Start Operability Test, performed 4/15/13 and 1/13/14
OPST-EDG-4126-03B, 6 Month B EDG Fast Start Operability Test, performed 3/23/14
OPST-FO-4195-02A, Fuel Oil Transfer Pump (P92-1A) and Discharge Check Valve (FO-28A) Operability Test (Quarterly), performed 12/30/13
OPST-FO-4195-02B, Fuel Oil Transfer Pump (P92-1B) and Discharge Check Valve (FO-28B) Operability Test (Quarterly), performed 10/15/13
OPST-FO-4195-03A, Fuel Oil Transfer Pump (P92-1B) and Discharge Check Valve (FO-28A) Operability Test (CYC), performed 7/2/13
OPST-FO-4195-03B, Fuel Oil Transfer Pump (P92-1B) and Discharge Check Valve (FO-28B) Operability Test (CYC), performed 1/13/14
OPST-RHR-4124-13B, RHR Pump B Operability Test (Quarterly), performed 10/15/13 and 1/26/13
OPST-4028-03, IST Valv1e Functional Testing - Air (V70-244A & V70-244B), performed 3/14/13
SPN-70828-710, Partial Installation and Test Procedure for EDCR 89-408 Fuel Pool Cooling System Enhancement Mechanical System Flushes, Hydrostatic Tests and System Operational Testing, performed 6/9/93 - 6/28/93
VYOPF 4102.06, Group II Manual Valve Refurbishment (V19-50), performed 3/21/13
VYOPF 4179.01, Normal FPCS Valve Operability Test, performed 12/5/13
VYOPF 4179.02, Standby FPCS Pump Operability and Discharge Check Valve Test, performed 12/5/13
VYOPF 4179.03, FPC System Check Valve Surveillance, performed 3/5/14
VYOPF 4179.06, Standby FPCS Pump Operability and Discharge Check Valve Comprehensive Test, performed 9/5/13
VYOPF 43106.01, Fuel Pool Level Functional Test, performed 12/5/13
52194572-01, Pump and Coupling Lubrications: P-19-2A), performed 2/2/10
52274554-01, As-Found Service Water Heat Exchanger Inspection (E-19-2A), performed 5/9/11
52274554-03, Vermont Yankee Non-Code Leak-Check Examination Report Form (E-19-2A), performed 5/12/11
52327811-01, Limitorque Motor Operator Inspection (V19-220), performed 4/26/12
52415659-02, Vermont Yankee Non-Code External Visual Examination Report Form for Bolting/Fasteners, Components and Piping (E-19-2A), performed 12/2/13
EDCR 89-408 (SPN 70828-710) Close Out Inspection, performed 7/16/93
TIMD075, V19-220 Equipment History Summary, 5/4/07 - 5/10/12
VYOPF 5217.01, MOV Motor Control Center (MC2) Test (V19-220), performed 9/1/10
VYOPF 5235.15, 480 VAC (Minor) Motor Inspection (P-19-2A), performed 2/11/10

Corrective Action Program Condition Reports:

2009-2832	2011-3966	2013-6737
2009-3378	2011-4749	2013-6786
2010-0342	2011-5580	2014-0392
2010-0550	2011-5646	2014-0399
2010-3351	2012-1472	2014-0562
2013-3639	2012-1777	2014-0588
2013-1971	2012-2279	2014-0679
2013-4297	2012-2281	2014-0950
2013-4346	2012-2295	2014-1084*
2013-4347	2012-2321	2014-1201*
2013-4641	2012-2563	2014-1226*
2014-1132*	2012-2745	2014-1235*
2014-1109*	2012-3590	2014-1254*
2014-1104*	2012-4687	2014-1282*
2014-1123*	2012-5044	2014-1288*
2014-1138*	2012-5967	2014-1290*
2014-1169*	2013-1942	2014-1322*
2014-1178*	2013-5712	
2014-1185	2013-6417	
2010-3714	2013-6649	
2011-1679	2013-6674	*NRC identified during this inspection.
2011-1920	2013-6681	
2011-3415	2013-6683	
2011-3829	2013-6708	

Drawings and Wiring Diagrams:

2293-7-1, GE/Bingham Pump Co. Characteristic Pump Curve 26537, Revision 1
5920-13823, Shts 1-6, 480”L x 156”W x 152” Inside Height Generator Enclosure, Revision J
5920-569, Primary Steam Piping, Revision 8
5920-4199, Leak Detection System for Spent Fuel Pool, Revision 0
B-191300, Sh. 30, Power Distribution and Motor Data 480V MCC-9B, Revision 41
B-191301, Sh. 328, Control Wiring, 4kV SWGR, DG-1-1B Breaker, Revision 20
B-191301 Sh. 1208, Control Wiring Diagram Fuel Pool Cooling System Isolation Valve V19-220, Revision 5
B-191301 Sh. 1223, Control Wiring Diagram Standby Fuel Pool Cooling System Pump P-19-2A, Revision 1
B-191301, Sh. 1531A, Control Wiring Diagram CP-115-9 – External Wiring East SWGR Room CO2 Fire Panel, Revision 12
D-9964, Fuel Pool Cooling Heat Exchanger P-19-2A/AB Details, Revision 4
G-191156, Flow Diagram Main, Extraction and Auxiliary Steam Systems, Revision 40
G-191160, Sht 7, Flow Diagram Diesel Generator Starting Air System, Revision 23
G-191162, Sht 2, Flow Diagram Miscellaneous Systems Fuel Oil, Revision 30
G-191172, Flow Diagram Residual Heat Removal System, Revision 73
G-191173, Sht. 1 Flow Diagram Fuel Pool Cooling & Cleanup System, Revision 40

G-191174, Sht. 1, Flow Diagram RCIC System, Revision 46
G-191298, Sh. 2, Main One Line Phasor Diagram, Revision 16
G-191298, Sh 3, Main One Line Wiring Diagram, Revision 3
G-191298, Sh 5, Relay One Line Wiring Diagram, Revision 6
G-191299, 4KV Auxiliary One Line Diagram, Revision 34
G-191300, Sh 1, 480V Aux. One Line Wiring Diagram, Revision 24
G-191301, Sht 1, 480V Aux. One Line Diagram SWGR Bus-9, MCC-9A, 9C, Revision 28

Engineering Evaluations:
AR 178778, P-19-2 PMCR Disposition, dated 6/3/13
CR-VTY-2010-3714, V19-18 & V19-224 Leakage Operability Evaluation, dated 7/19/10
CR-VTY-2013-4347, Valves FPC-23 and FPC-22B Component Mispositioning Event Apparent Cause Evaluation Report, dated 7/23/13
EC 1876, New EDG FO Consumption Rates and Analysis for Using Ultra-Low Sulfur Fuel Oil, Revision 2
EC 37986, Installation of 3000KW/3750 kVA SBO DG and 4160 SWGR, Revision 0
EC 39144, Calculation VYC-1404 Disposition – Mechanical Design Engineering Impact of Lining FOST, Revision 0
EC 37986, SBO Diesel, Revision 0
F09238-R-001, Evaluation of Spent Fuel Heat Exchanger Cooling Pipe, Revision 0
PMCR 178778, Change Request Evaluation, P-19-2A, dated 6/3/13
PMCR 49407, Change the Replacement Frequency of RCIC EGM, dated 12/1/08
SCR 2004E-033, Setpoint Change Request SFPC Pump Motor Protection, dated 5/27/04
TE-2002-004, RHR/LPCI/Containment Spray Performance Characteristics, dated 6/27/02
VYSE-MRL-2011-005, 10CFR50.65 Maintenance Rule Performance Improvement/Action Plan for Standby Fuel Pool Cooling (SBFPC) - Equipment Train “A”, dated 11/30/11
50.59 Evaluation 13-001, EC 37986, SBO AAC Revision 0
91658, Procurement Engineering Evaluation, DG-1-1A/B Header to Turbo for Crank Case Ejector Hose, dated 4/28/11

Licensing and Design Basis Documentation:
DBD for Emergency Diesel Generator and Auxiliary Systems, Revision 23
DBD for 480Vac, 4.16kV/480V System, Revision 45
DBD for Main Steam System, Revision 20
DBD for RCIC, Revision 20
DBD for Residual Heat Removal System, Revision 25
LAR-2010-00309, Implement the Neutron Absorver Monitoring Program, dated 10/14/10
VYNPS UFSAR, Section 8 – Station Electrical Power Systems, Revision 17

Miscellaneous Documents:
3388152, Mobil Mobilgard 450 LO Analysis Reports DG-1-1B, 5/1/13 and 12/12/13
43106.02, Fuel Pool Level Transmitter Data Sheet, dated 12/30/13
10 CFR 50.63, Loss of All Alternating Current Power
10CFR50.65 Maintenance Rule Scoping Basis Document, 24 Volts DC Electrical, Revision 6
10CFR50.65 Maintenance Rule Scoping Basis Document, 480 Volts AC Electrical, Revision 6
10CFR50.65 Maintenance Rule Scoping Basis Document, 4K Volts AC Electrical, Revision 4
10CFR50.65 Maintenance Rule Scoping Basis Document, Emergency Diesel Generator & Auxiliaries, Revision 3

10CFR50.65 Maintenance Rule Performance Evaluation Improvement Plan for RCIC, dated 2/7/13
10CFR50.65 Maintenance Rule Scoping Basis Document for Standby Fuel Pool Cooling (SBFPC), Revision 2
BVY 11-010, Letter VY to NRC Regarding Spent Fuel Pool Aging Program, dated 2/4/11
BVY 12-084, Changes to 10CFR50.63 Licensing Basis Vermont Yankee Nuclear Power Station, dated 12/21/12
CHOP-DIES-4613-01, Diesel Fuel Oil Analysis Results for Bulk MFOST Delivery, 5/21/13
Control Room Logs, dated 6/21/10 to 6/22/10
ENS-Pump-Horizontal Preventive Maintenance Optimization System (PMOS) PM Basis Template, Revision 2
ENN-SEP-IST-001 Table 6, IST Component Basis – Valves (FPC & SFPC), Revision 5
EPRI NP-7552M Project 3052-1, Heat Exchanger Performance Monitoring Guidelines, December 1991
ER # 99-0626, VY Level 2 Event Report – Monthly EDG Air Receiver Test Out of Spec, 5/27/99
ER-99-0626, Monthly EDG Air Receiver Test Out of Spec, 5/26/99
eSoms Suite Operator Rounds (Spent Fuel Pool Level), dated 2/28/14 - 3/7/14
eSoms Suite Operator Rounds (Spent Fuel Pool Temperature), dated 2/27/14 - 3/7/14
Heat Exchanger Tube Data (E-19-2A & E-19-2B), dated 3/18/14
LOT-01-264, Operator Lesson Plan - Station Blackout Diesel Generator System Walkthrough, Revision 1
NUMARC-8700, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, dated 11/20/87
Operability Recommendations, SW Flow to EDG during ECCS Test CR-VTY-2011-04747, dated 10/27/11
Operator Rounds Log, SFPC Pumps A/B Oil Levels, 2/18/14 through 3/14/14
Quality Requirements for Purchase Order No. 43410, dated 11/5/90
Regulatory Guide 1.155, Station Blackout
PD041333, Record of Eddy Current Inspection of EDG DG-1-1A Heat Exchangers, Feb 2012
PD041434, Record of Eddy Current Inspection of EDG DG-1-1B Heat Exchangers, June 2013
PMRQ 50042935, Ten Year P-19-2A Motor Bearing Replacement, dated 12/30/13
RHR Pump B Motor Lower Bearing Lube Oil Analysis Reports – Mobil Vaprotech Light, 8/20/09 through 7/26/13
SEP-HX-VTY-001, VY Heat Exchanger Program, Revision 0
SEP-SW-VTY-002, VY Service Water Program, Revision 0
SEP-VTY-IST-001, Vermont Yankee Nuclear Power Station Inservice Testing Program Plan Fifth Ten Year Interval, Revision 1
TIMD090, Bill of Materials (V19-220), dated 3/14/14
Tube Plugging Map (E-19-2A), dated 3/18/14

Non-Destructive Examinations

09-004, Ultrasonic Thickness Examination Report (6”SW-801), dated 1/29/09
09-006, Ultrasonic Thickness Examination Report (6”SW-801B), dated 1/24/09
9607N208, Eddy Current Inspection of Standby Fuel Pool Coolers “A and B” at the Vermont Yankee Plant in Vernon Vermont, dated 11/22/96
PD04698, Record of Eddy Current Inspection of Standby Fuel Pool Coolers E-19-2A and
PD041242, Record of Eddy Current Inspection of Standby Fuel Pool Cooler E-19-2B at Vermont Yankee Nuclear Power Station, dated 2/9/11

PD041268, Record of Eddy Current Inspection of Standby Fuel Pool Cooler E-19-2A at E-19-2B at Vermont Yankee Nuclear Power Station, February 2005
Vermont Yankee Nuclear Power Station, dated 5/11/11

Procedures:
ARS 21002, Fuel Pool Cooling System Alarm Response, Revision 16
ARS 21009 FP-E-3, Fuel Pool Cooling Alarm Response, Revision 2
CHOP-CCW-4623-01, Sampling and Treatment of Closed Cooling Water Systems, Revision 4
EN-DC-115, Engineering Change Process, Revision 16
EN-DC-126, Engineering Calculation Process, Revision 5
EN-DC-141, Design Inputs, Revision 14
EN-DC-204, Maintenance Rule Scope and Basis, Revision 3
EN-DC-313, Procurement Engineering Process, Revision 10
EN-DC-316, Heat Exchanger Performance and Condition Monitoring, Revision 6
EN-DC-324, Preventive Maintenance Program, Revision 12
EN-DC-184, NRC Generic Letter 89-13 Service Water Program, Revision 3
EN-MA-133, Control of Scaffolding – Seismic Scaffold Criteria, Revision 10
EN-MP-112, Shelf Life Program, Revision 5
EN-MS-S-011, Conduct of Systems Engineering, Revision 10
EN-OP-104, Operability Determination, Revision 7
EOP-4, Secondary Containment Control and Radioactivity Release Control, Revision 3
MMMP-EDG-5223-20, Emergency Diesel Generator Maintenance, Revision 04
ON 3156, Loss of Shutdown Cooling, Revision 14
ON 3157, Loss of Fuel Pool Level/Cooling, Revision 11
OP 1101, Management of Refueling Activities and Fuel Assembly Movement, Revision 52
OP 2113, Main and Auxiliary Steam, Revision 34
OP 2115, Primary Containment, Revision 84
OP 2121, RCIC System, Revision 58
OP 2179, Standby Fuel Pool Cooling, Revision16
OP 4113, Main and Auxiliary Steam System Surveillance, Revision 35
OP 4142, Vernon Tie and Delayed Access Power Source Backfeed Surveillance, Revision 19
OP 4179, Standby Fuel Pool Cooling Surveillance, Revision 22
OP 5202, Maintenance/Inspection of Heat Exchangers, Pressure Vessels and Tanks, Revision 29
OP 5225, EDG Electrical Maintenance, Revision 27
OP 5376, RCIC Control System Calibration Test, Revision 8
OP 43106, Fuel Pool Level Functional/Calibration, Revision 8
OPOP-NFPC- 2184, Normal Fuel Pool Cooling System, Revision 7
OPOP-RHR- 2124, Residual Heat Removal System, Revision 10
OPOP-PHEN-3127, Natural Phenomena, Revision 15
OPOP-PREP-2196, Seasonal Preparedness, Revision 5
OPOP-SBO-10066, Station Blackout Diesel Generator, Revision 2
OPOT-3122-01, Loss of Normal Power, Revision 2
OPOT-3122-02, Station Blackout, Revision 3
OPST-EDG-4126-07B, 2 YR B EDG Starting Air Solenoid Valve Independent Operability Test, Revision 1
OPST-EDG-4126-09B, B EDG Room Air Intake Louver Operability Test, Revision 0
OPST-EDG-4126-12B, B EDG Standby Verification, Revision 0

OPST-RCIC-4121, RCIC System Surveillance, Revision 5
Special Engineering Procedure 300079-01, Procedure for Assembly and Testing of the Boron 10 Areal Density Meter at VYNPS, dated 1/30/14

System Health Reports:
EDG - Emergency Diesel Generators, 4th Qtr 2013 (10/1/13 – 12/31/13)
Fuel Pool Cooling System Health Report, Q4-2013
Heat Exchanger Program Health Report, Q3-2013
Maintenance Rule Unavailability Trend for SBFPC System - Equipment Train A, (10/8 - 8/11)
MS 101 – Main Steam, 4th Qtr 2013 (10/1/13 – 12/31/13)
Standby Fuel Pool Cooling System Health Report, Q4-2013
RHR - Residual Heat Removal, 4th Qtr 2013 (10/1/13 – 12/31/13)

Vendor Manuals:
C0691078, Custom Pump Curve for P-19-2A Fuel Pool Cooling Pump, dated 3/18/92
Heat Exchanger Specification Sheet (SFPC HXs), dated 11/21/94
PDS Trend Tool (Fuel Pool Water Level), dated 12/3/13 - 12/7/13 & 4/7/13 - 4/2/14
PDS Trend Tool (Spent Fuel Pool Temperature), dated 3/9/13 - 4/3/13
VYEM No. 0005, Reactor Water Clean-Up, Standby Fuel Pool Cooling Instruction Manuals, Revision 1
VYEM 0019, Conax Instructions for RTD and Thermocouple Assemblies, Revision 2
VYEM 0046, Westinghouse-Installation and Maintenance Instructions for Medium AC Motors, Revision 6
VYEM-0067, Residual Heat Removal (RHR) Installation-Operation-Maintenance Instructions, Revision 1
VYEM-0079, RAL-5396, Edwards Valves Inc./Rockwell Mfg. Co. Model 1612 JMMY Main Steam Isolation Valves Instruction Manual, Revision 0
VYEM-0107, Model 38TD8-1/8 Emergency Diesel Generators Service Manual, Revision 18
VYEM No. 0237, SBFPC (Standby Fuel Pool Cooling) Equipment Manual, Revision 0
VYS-013, Specification for Gate Valves (Standby Fuel Pool Valves), Revision 1
VYS-019, Specification for Standby Fuel Pool Cooling Pumps, Revision 2
VYS-021, Specification for Alternating Current Induction Motors for Fuel Pool Cooling Emergency Standby Pumps, Revision 1

Work Orders:

00316712	52415659	52365594
00369338	52412951	52395084
52194572	04002464	52500575
52194573	52327728	52527171
52216892	52328305	52527172
52274554	52363743	
52327811	52365591	

LIST OF ACRONYMS

AAC	Alternate Alternating Current
AC	Alternating Current
ADAMS	Agencywide Documents Access and Management System
CAP	Corrective Action Program
CDBI	Component Design Bases Inspection
CFR	Code of Federal Regulations
CR	Condition Report
CST	Condensate Storage Tank
DBD	Design Basis Document
DC	Direct Current
DG	Diesel Generator
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
EC	Engineering Change
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EPU	Extended Power Uprate
FIN	Finding
FOST	Fuel Oil Storage Tank
HX	eat Exchanger
IMC	Inspection Manual Chapter
IN	Information Notice
IP	Inspection Procedure
ISO-NE	Independent System Operator New England
IST	In-Service Test
JW	Jacket Water
kV	Kilovolts
LERF	Large Early Release Frequency
LOCA	Loss-of-Coolant Accident
LPCI	Low Pressure Cooling Injection
MCC	Minor Calculation Change
MSIV	Main Steam Isolation Valve
NCV	Non-cited Violation
NPSH	Net Positive Suction Head
NRC	U.S. Nuclear Regulatory Commission
OE	Operating Experience
OPESS	Operating Experience Smart Sample
PM	Preventive Maintenance
PRA	Probabilistic Risk Assessment
RAW	Risk Achievement Worth
RCIC	Reactor core Isolation Cooling
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RRW	Risk Reduction Worth

SBO	Station Blackout
SDP	Significance Determination Process
SER	Safety Evaluation Report
SFPC	Standby Fuel Pool Cooling
SFPCS	Standby Fuel Pool Cooking Subsystem
SPAR	Standardized Plant Analysis Risk
SSC	Structure, System, and Component
SW	Service Water
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
VAC	Volts, Alternating Current
VHS	Vernon Hydroelectric Station