July 27, 2001

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

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - NRC INSPECTION REPORT 05000271/2001-003

Dear Mr. Balduzzi:

On July 13, 2001, the NRC completed an inspection at your Vermont Yankee Nuclear Power Station. The enclosed report documents the inspection findings which were discussed on July 13, 2001, with Mr. D. Leach and other members of your staff.

The inspection examined your fire protection and post-fire safe shutdown programs. The inspectors reviewed selected procedures and records, observed activities and material condition of installed systems and equipment, and interviewed personnel.

No findings of significance were identified.

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Sincerely,

/RA/

James C. Linville, Chief
Electrical Branch
Division of Reactor Safety

Docket Nos.: 05000271
License No: DPR-28

Enclosure: Inspection Report 50-271/01-03

cc w/encl:
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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No:	05000271
License No:	DPR-28
Report No:	05000271/2001-003
Licensee:	Vermont Yankee Nuclear Power Corporation
Facility:	Vermont Yankee Nuclear Power Station
Location:	546 Governor Hunt Rd. Vernon, VT 05354
Dates:	June 25-29, July 9-13, 2001
Inspectors:	R. Fuhrmeister, Senior Reactor Inspector J. Williams, Senior Operations Engineer R. Bhatia, Reactor Inspector K. Young, Reactor Inspector
Approved by:	J. Linville, Chief Electrical Branch Division of Reactor Safety

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SUMMARY OF FINDINGS

IR 05000271-01-03, Vermont Yankee Nuclear Power Corporation, Vermont Yankee Nuclear Power Station, Fire Protection.

The inspection was conducted by regional specialist inspectors. 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 are indicated by “No Color” or by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGHT/index.html.

A. Inspector Identified Findings

No significant findings identified

Report Details

Background

This report presents the results of a triennial fire protection team inspection conducted in accordance with NRC Inspection Procedure (IP) 71111.05, “Fire Protection.” The objective of the inspection was to assess whether Vermont Yankee Nuclear Power Corporation (VYNPC) has implemented an adequate fire protection program and whether post-fire safe shutdown capabilities have been established and are being properly maintained. Fire zones were selected for detailed review based on risk information in the Individual Plant Evaluation for External Events (IPEEE). Fire Zones chosen for the inspection were Control Room, Cable Vault, West Switchgear Room, and Reactor Building 252' Elevation - North Side.

This inspection was a reduced scope inspection in accordance with the March 23, 2001 revision to IP 71111.05. Issues regarding equipment malfunction due to fire-induced failures of associated circuits were not inspected. Criteria for review of fire-induced circuit failures are currently the subject of a voluntary industry initiative. The definition of associated circuits of concern used was that contained in the March 22, 1982, memorandum from Mattson to Eisenhut, which clarified the requests for information made in Generic Letter 81-12.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems

1RO5 Fire Protection

.1 Programmatic Controls

a. Inspection Scope

During tours of the Vermont Yankee Nuclear Power Station (VYNPS), facility, the team observed the material condition of fire protection systems and equipment, the storage of permanent and transient combustible materials, and control of ignition sources. The team also reviewed the procedures that controlled hot-work activities and combustibles at the site. This was accomplished to verify that VYNPC was maintaining the fire protection systems, controlling hot-work activities, and controlling combustible materials in accordance with their fire protection program.

b. Findings

No findings of significance were identified.

.2 Fire Barrier Penetration Seals

a. Inspection Scope

The team randomly selected three fire barrier penetration seals for detail inspection to verify proper installation and qualification. The team reviewed associated design drawings, Underwriters Laboratories test reports, BISCO test reports and surveillance procedures. The team compared the observed in-situ seal configurations to the design

drawings and tested configurations. Additionally, the team compared the penetration seal ratings with the ratings of the barriers in which they were installed and observed the material condition of the selected penetration seals. This was accomplished to verify that the licensee had installed the selected penetration seals in accordance with their design and licensing bases.

b. Findings

No findings of significance were identified.

.3 Post-Fire Shutdown Emergency Lighting

a. Inspection Scope

The team observed the placement and aim of 8-hour emergency lights throughout the selected fire zones to evaluate their adequacy for illuminating access and egress pathways and any equipment requiring local operation for post-fire safe shutdown. In addition, during the alternate shutdown procedure walkthrough documented in Section .9, "Operational Implementation of Alternate Shutdown," the team verified that emergency lights were provided where needed.

The team reviewed preventive maintenance procedures, surveillance procedures, a maintenance rule Sentry light system status report, and a vendor manual for 8-hour emergency lights to determine if adequate surveillance testing and preventive maintenance was being accomplished to ensure operation of the 8-hour emergency lights.

b. Observations and Findings

No findings of significance were identified.

.4 Electrical Raceway Fire Barrier System

a. Inspection Scope

The team walked down accessible portions of the selected fire areas to observe material condition and the adequacy of design of fire area boundaries, fire doors, and fire dampers. Additionally, the team reviewed design and installation drawings, engineering evaluations, surveillance and functional test procedures for selected items. The NRC safety evaluations of fire protection features for VYNPS were also reviewed by the team. Additionally, the team reviewed the design and qualification testing for the 3M Interam® Mat and Hemyc electrical raceway fire barriers, and performed a walkdown of installed barriers for the selected areas. This review was performed to verify that the selected items of the fire barrier system met their design and licensing bases.

b. Findings

Raceway Protection

10 CFR 50.48(b) states that for nuclear power plants licensed to operate prior to January 1, 1979, fire barriers installed to protect the post-fire safe shutdown capability, whether installed before or after 10 CFR 50 Appendix R became effective, are required to satisfy the technical requirements of Section III.G of 10 CFR 50 Appendix R. This section requires, in part, that raceway enclosures utilized in areas with fire detectors and automatic suppression shall have a one-hour fire rating. Generic Letter (GL) 86-10, "Implementation of Fire Protection Requirements," presents acceptable methods for satisfying the technical requirements of Appendix R, including guidance for fire barriers. GL 86-10 states that the documentation establishing the rating of a fire barrier should include the design description of the barrier and the test reports that verify its rating. The GL also provides the fire test acceptance criteria for establishing the fire rating of a barrier.

At VYNPS, Hemyc wrap has been utilized to protect selected raceways to meet the separation requirements of 10 CFR 50, Appendix R. The Hemyc design is typically a 1½-inch nominal alumina silicate fiber (a Kaowool type material) blanket encapsulated in Siltemp 84 fabric on the outside (side exposed to the fire) and a Klevers 600/6 fiberglass mat on the inside. Within the areas selected for inspection, Hemyc was installed to protect the power supply conduits for residual heat removal (RHR) pump A. Since Hemyc fire barriers were installed after the effective date of Appendix R, they are required to meet the technical requirements of Appendix R or have appropriate documentation to justify a deviation.

The team reviewed the following qualification test documentation utilized by VYNPC as the bases for qualifying the Hemyc system as a one hour fire barrier for raceways:

- Insulco Incorporated Test CTP-1026, "Fire Qualification Test 'Hemyc' Cable Wrap System as Installed by Insulco Inc. and Affiliated Companies," June 1, 1982.

- Promatec, Inc. CTP-1077, "One (1) Hour Fire Test on 3" Conduit for NES," March 10, 1986.

Test Report CTP-1026 provides the results of three tests designed to establish the one hour rating for raceway barriers. VYNPC did not evaluate Test No. 1 because it was focused toward cable tray installations. Test Nos. 2 and 3 were utilized because they protect 4-inch conduit which is utilized at VYNPS. The team reviewed testing for the configurations that were most representative of the VYNPS installation inspected by the team.

Test No. 2 consisted of a single 12-inch ladder-back cable tray with a single layer of cabling consisting of equal volumes of 300 mcm cables, seven conductor No. 12 American Wine Gage (AGW) cables, and two conductor No. 16 AWG cables. Additionally, two 4-inch conduits with 100% cable fill was protected by a stand-off with a 1½ inch thick barrier (air space between barrier and conduit). This cable tray and

conduit were enclosed in a single fire barrier enclosure consisting of an inner fiberglass clothwrap, a single layer of 1½ inch Kaowool blanket installed over a steel framework that provided a minimum 2-inch airgap between the wrap and the trays, and an outer layer of Siltemp fabric.

Test No. 3 included a cable tray installation similar to that in Test No. 2 except with a 100% cable fill. This test also included a single 4-inch conduit with 100% cable fill. The conduit fire barrier system consisted of a 2-inch thick barrier directly applied to the conduit (no airspace between the barrier and the conduit).

These tests were conducted in accordance with ANI/MAERP "Standard Fire Endurance Test Method to Qualify a Protective Envelope for Class 1E Electrical Circuits." NRC Generic Letter 86-10 specified ASTM E-119, "Standard Test Methods for Fire Tests of Building Construction and Materials," as the acceptable testing method. Testing to the insurance standard rather than to ASTM E-119 presented the following concerns:

- ASTM E-119 is specific as to the type of thermocouple to be used in the testing, specifically fusion welded No. 18 AWG Chromel-Alumel wire. Test Report CTP-1026 states that "Pt-Rd (Platinum-Rhodium)" thermocouples were used which could affect the time delay and accuracy of the measurement used to determine the furnace temperature profile.

- ASTM E-119 requires a minimum of nine thermocouples distributed throughout the furnace to control the test fire curve. The thermocouples must also be mounted in minimum 12-inch long protective tubing and distributed throughout the furnace. This practice is necessary to confirm that the furnace has a uniform heat flux and is exposing all faces of the test article. Test CTP-1026 used only one thermocouple and one "reserve" thermocouple, both of which were located in the back of the furnace to control the test curve.

- ASTM E-119 requires that the minimum furnace be sized to test a 100 ft^2 sample. The furnace used in the test was only approximately 33 ft^2.

- ASTM E-119 requires thermocouples to be located on the cold-side surface of the barrier to measure at least nine separate points with an acceptance criteria that the temperature rise does not exceed 250 ^oF over the ambient starting temperature. The team found that the number and location of thermocouples may not have been sufficient to obtain an accurate thermal profile of the raceways. Specifically, Test Nos. 2 and 3 utilized nine and ten thermocouples, respectively and the test report did not state specifically where the thermocouples were located. Sketches included in the report indicated the thermocouples for Test No. 2 were installed on cables located in the bottom of the tray and three located on the top of the tray. Additionally, two thermocouples were located inside of the 4-inch conduit pair. Test No. 3 provided nine thermocouples in the cable tray and one thermocouple in the 4-inch conduit.

The team identified several concerns regarding the measured temperatures. For example, during Test No. 2, the temperatures of the thermocouples on the bottom of the tray exceeded the average allowable temperature rise at approximately 38 minutes and

the temperature plot for the three thermocouples located on cables in the top of the tray stopped at 55 minutes, corresponding to a temperature rise of 250 °F. Additionally, the thermocouples located on the inside of the 4-inch conduit pair exceeded the allowable temperature rise in approximately 42 minutes. During Test No. 3, the single 4-inch conduit exceeded the allowable temperature rise at approximately 42 minutes and readings for all of the thermocouples in the 12-inch cable tray remained below the maximum allowable temperature.

Finally, the team noted that the potential effects of raceway supports on the test results appeared to be beyond the scope of all three of the tests, as the report does not discuss their interface or protection requirements. There were no thermocouples on or near supports to determine their impact on the temperature rise inside the fire barrier systems.

The team also reviewed Test Report CTP-1077 which was a one-hour test on a 3-inch conduit. The team noted that the report introduction states that, “This report consists of an analysis of the one-hour fire exposure test performed on October 29, 1984, as an engineering test during the performance of a standard three-hour fire test on a different system. It is fully realized that this test is an engineering test only, and it does not qualify as a fully acceptable one-hour test. The purpose of this report was to analyze the data collected, determine the weak points, and recommend configurations for future evaluations.”

The test specimen consisted of a three-inch conduit with two 300 MCM cables, four No. 12 AWG seven conductor and eleven No. 16 AWG two conductor poly vinyl chloride (PVC) jacketed cables resulting in a 50% fill. The team identified similar concerns to those discussed above, with this test method as compared to ASTM E-119, including:

- The analysis does not provide sufficient information to determine the type of thermocouples that were used in the test.

- The test used only six thermocouples to measure internal barrier temperatures, of which, one appears to have failed at approximately four minutes into the test.

- The furnace used in the test was not described sufficiently to evaluate compliance with the standard.

- The test report does not state exactly where the thermocouples were attached to the test specimen.

The team noted that the Hemyc installation inspected at VYNPS was in good condition. However, based on the review of test reports CTP-1026 and CTP-1077, the team determined that the results of the engineering test alone were inconclusive for qualifying the fire barrier system as a one-hour rated fire barrier.

The NRC has previously identified similar Hemyc qualification test issues at the Shearon Harris Nuclear Power Plant (IR 50-400/99-13) and the NRC Region II office requested the Office of Nuclear Reactor Regulation (NRR) assistance in Task Interface Agreement (TIA) 99-028, dated November 23, 1999, in evaluating the resolution of these items.

This issue is unresolved pending further NRC review to determine whether the qualification tests of the Hemyc fire barrier wrap systems are acceptable. **(URI 05000271/2001-003-01)**

.5 Fixed Fire Suppression Systems

a. Inspection Scope

The team evaluated the adequacy of the automatic total flooding low pressure carbon dioxide (CO_2)system in the west switchgear room, the automatic total flooding high pressure CO_2 system in the cable vault room, and the pre-action sprinkler system in the north end of the reactor building by performing a walkdown of the system, review of initial system testing, and review of functional testing. In addition, the team verified the CO_2 systems and pre-action sprinkler system functionality and the adequacy of surveillance procedure testing by reviewing several completed surveillance procedures. Additionally, the team reviewed fire damper surveillance procedures to ensure functionality of the fire dampers in the west switchgear room and cable vault room. This review was performed to verify that the selected fixed suppression systems met their design and licensing bases.

b. Findings

No findings of significance were identified.

.6 Manual Fire Suppression Equipment

a. Inspection Scope

The team walked down selected standpipe systems and portable extinguishers to determine the material condition of manual fire fighting systems. Electric fire pump flow, diesel fire pump flow, and pressure tests were also reviewed by the team to ensure the pumps were meeting design requirements. Additionally, the team reviewed recent fire main loop flow tests and a standpipe calculation to ensure adequate flow and pressure could be delivered to hose and sprinkler systems.

The team inspected the fire brigade's protective ensembles, self-contained breathing apparatus (SCBA), portable communications equipment and various other fire brigade equipment to determine material condition and operational readiness of equipment for fire fighting.

b.

c. Findings

No findings of significance were identified.

.7 Communications

a. Inspection Scope

The team reviewed the VYNPS portable radio system transponder location and discussed portable radio communication with the fire protection coordinator and a fire brigade leader to determine if communications could be maintained in the event of a fire at the site. Additionally, the team reviewed radio system maintenance and surveillance procedures to determine if VYNPC was properly maintaining the radio system.

b. Findings

No findings of significance were identified.

.8 Fire Detection Systems

a. Inspection Scope

The team performed a walkdown of the selected fire zones to verify the existence and adequacy of fire detection in the selected fire zones. In addition, the team reviewed completed surveillance procedures and smoke detection installation system drawings to verify the adequacy and frequency of fire detection component testing. This review was performed to ensure that the fire detection systems for the selected fire zones met their design and licensing bases.

b. Findings

No findings of significance were identified.

.9 Operational Implementation of Alternative Shutdown Capability

a. Inspection Scope

The team reviewed Operating Procedure (OP) 3126, “Shutdown Using Alternate Shutdown Methods,” Revision 16, which directs the operator actions in the event of inaccessibility of the control room or damage outside the control room which would render the normal control room controls or indications unreliable. The purpose of this review was to determine if appropriate information is provided to plant operators to identify protected equipment and instrumentation and if recovery actions specified in post-fire safe shutdown procedures consider manpower needs for performing restorations and area accessibility. The team also reviewed qualification practical factors for reactor operators and job performance measures for the alternative shutdown actions, discussed training with licensed operators and non-licensed operators, reviewed minimum shift manning required by technical specifications, evaluated the accessibility of the alternative shutdown operating stations and the accessibility of required manual action locations, and reviewed the pre-fire plans for the target areas.

b. Findings

No findings of significance were identified.

.10 Alternate Safe Shutdown Design

a. Inspection Scope

The team reviewed the Updated Final Safety Analysis Report (UFSAR), the Fire Hazards Analysis (FHA), and the Safe Shutdown Capability Analysis (SSCA), to evaluate the methods and equipment used to achieve hot shutdown following postulated fires in the cable vault, the west switchgear room, selected portions of the reactor building and the main control room fire areas. The team further reviewed piping and instrumentation drawings (P&IDs) for post-fire safe shutdown systems to determine required components for establishing flow paths, identify equipment required to isolate flow diversion paths, and verify appropriate components were on the alternate safe shutdown equipment list. The team also performed field walk-downs to validate the equipment location determinations used in the analysis.

The team reviewed electrical and control drawings for the VYNPS power supply sources and applicable circuit breakers required to supply power to Alternate safe shutdown (ASD) panels and the required equipment including the independent Vernon Tie Line power supply from Vernon Hydro station, which is hard wired to manually operated switches to power either one of the two trains of the safe shutdown components. The team also reviewed the calibration and testing of protective devices of the ASD power distribution system and control and monitoring instruments of remote alternate safe shutdown panels to ensure that proper isolation was provided for

alternate shutdown capability for fires in the control room and other fire areas. The team conducted field walk-downs to evaluate the protection of the equipment from the effects of fires. The team also reviewed alternate independent power supply manual switches and remote alternate safe shutdown panels operability test procedures to determine if VYNPC was appropriately testing the applicable ASD power sources and transfer switch functions.

The team reviewed the capability of the ASD power distribution system including the safety equipment terminal voltage and electrical devices and circuit breaker coordination to ensure that equipment needed for a post-fire safe shutdown would not be impacted due to a lack of adequate voltage and coordination. The team also reviewed testing and preventive maintenance procedures for selected safe shutdown components, the Vernon tie-line, and other applicable power distribution circuit breakers to determine if VYNPC was appropriately maintaining them in a state of readiness. These procedures were reviewed to determine if the circuit breakers that provide electrical power and provide protection to post-fire safe shutdown components could operate when called upon.

b. Findings

No findings of significance were identified.

.11 Safe Shutdown Circuit Analyses

a. Inspection Scope

The team reviewed the VYNPS SSCA to assess the adequacy of the methodology applied in the analysis. The team also reviewed the power and control cable routing for a sample of risk-significant post-fire safe shutdown components to determine if the cables were properly routed outside the fire areas of concern or protected against the effects of the postulated fires. The team also walked down certain portions of cable routing to confirm that the cables required for alternate safe shutdown would not be impacted by the postulated fires.

Due to the issuance of Change Notice 00-020 against Inspection Procedure 71111.05, “Fire Protection,” the team did not review equipment malfunctions caused by fire-induced damage to associated circuits during this inspection. This change notice has suspended this review pending completion of an industry initiative in this area.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA4 Other

.1 Corrective Actions for Fire Protection Deficiencies

a. Inspection Scope

The team reviewed Quality Assurance audits and self-assessments of the fire protection program conducted during the previous two years. In addition, the team reviewed a sample of open Event Reports, and those closed within the past year, which had been issued for fire protection program and equipment problems identified by VYNPC. The purpose of the reviews was to evaluate the ability of VYNPC to identify and correct fire protection problems.

b. Findings

No findings of significance were identified,

4OA5 Management Meetings

.1 Exit Meeting Summary

The inspectors presented their preliminary inspection results to Mr. D. Leach and other members of the VYNPC staff at an exit meeting on July 13, 2001.

The inspectors asked whether any materials examined during the inspection should be considered proprietary. No information was identified as being proprietary.

PARTIAL LIST OF PERSONS CONTACTED

Vermont Yankee Nuclear Power Corporation

D. Leach, Vice President of Engineering
K. Bronson, Plant Manager
J. Dreyfuss, Superintendent of System Engineering
P. Corbett, Superintendent of Engineering Support
C. Wamser, Superintendent of Operations
R. Wanczyk, Director of Safety and Regulatory Affairs
J. Boothroyd, Fire Protection Engineer
D. Girroir, Programs Supervisor
B. Hall, Senior QA Assessor
M. Palionis, Senior PSA Engineer
L. Casella, Fire Protection Coordinator
P. Johnson, Senior Principal Engineer/ Appendix R Coordinator
J. Meyer, Licensing Engineer
R. January, Lead Electrical/I&C Engineer
S. Aprea, Supervisory Control Room Operator
M. Flynn Jr., Design Engineer
C. Kohl, Electrical Engineer

Nuclear Regulatory Commission

B. McDermott, Senior Resident inspector
E. Knutson, Resident Inspector
J. Linville, Electrical Engineering Branch Chief
M. Salley, Fire Protection Engineer

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

None

Opened

URI	05000271/2001-005-01	Adequacy of Hemyc Cable Wrap Fire Barrier Qualification Test and Evaluation

Closed

None

Discussed

None

LIST OF ACRONYMS USED

ASTM	American Society for Testing and Materials
AWG	American Wire Gage
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
ELU	Emergency Lighting Unit
ER	Event Report
ERFBS	Electrical Raceway Fire Barrier System
FHA	Fire Hazards Analysis
IP	Inspection Procedure
GL	Generic Letter
IP	Inspection Procedure
IPEEE	Individual Plant Evaluation for External Events
IR	Inspection Report
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
OP	Operating Procedure
P&ID	Piping and Instrumentation Drawings
PVC	Poly Vinyl Chloride
RHR	Residual Heat Removal
SCBA	Self Contained Breathing Apparatus
SSCA	Safe Shutdown Capability Analysis
TIA	Task Interface Agreement
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VYNPC	Vermont Yankee Nuclear Power Corporation
VYNPS	Vermont Yankee Nuclear Power Station

LIST OF DOCUMENTS REVIEWED

Fire Protection Program Documents

Vermont Yankee Nuclear Power Corporation Fire Hazards Analysis, Rev. 4
Vermont Yankee Safe Shutdown Capability Analysis, Rev. 5
Pre Fire Plan CB-1, Control Room, 04/14/00
Pre Fire Plan CB-2, Cable Vault, 09/14/00
Pre Fire Plan CB-3, Switchgear Rooms, 05/07/01
Pre Fire Plan CB-7, Reactor Building - North (RB-3)
PP 7011, Rev. 0, “Vermont Yankee Fire Protection and Appendix R Program”
VYNPS Technical Requirements Manual, Rev. 4, Sections 3.13, 4.13

Training Documents

LOT-00-612, Rev.18, “Shutdown Using Alternate Shutdown Methods”, dated June 1999
TCR (Training Change Request) 99-0528, OP-3126, dated 11/04/99
JPM- 21804, “Lineup to Operate SRV-71A&B from the RCIC Room, Rev. 8, dated 9/00
JPM-20502, “Start-Up Shutdown Cooling from the Remote Shutdown Panel”, Rev. 7, dated 6/99
JPM-21701, “Operate RCIC from the Alternate Shutdown Panel”, Rev. 9, dated 6/99
JPM-29502, “Initial Actions for a Control Room Evacuation”, Rev. 0, dated 5/00
JPM-20503, “Start-Up Torus Cooling from the Alternate Shutdown Panel”, Rev.8, dated 3/96
Time lines for OP-3126 performed June 6, 2001, dated 6/15/01
Fire Brigade Drill Scenario No. 40, “Reactor Building, South (RB-6), Elevation 280', Standby Gas”
Fire Drill Review, 4/18/01
Fire Brigade Drill Scenario No. 10, “East Switchgear Room - Station Service Transformer T-9-1A”
Fire Drill Review, 4/17/01

Procedures

OP-3126, “Shutdown Using Alternate Shutdown Methods”, Rev. 16, dated 3/21/00 with change number 5, dated 6/21/01
AP 0042, Rev. 26, “Plant Fire Prevention and Fire Protection”
AP 3700, Rev. 12, “Fire Training”
DP 0863, Rev. 2, “Operational Inspection and Testing of Security Equipment”
OP 0046, Rev. 6, “Installation and Repair of Fire Barriers, Penetration Seals, Fire Breaks and Flood Seals”
OP 2186, Rev. 25, “Fire Suppression Systems”
OP 3020, Rev. 2, “Fire Emergency Response Procedure”
OP 3504, Rev. 32, “Emergency Communications”
OP 4001, Rev. 6, “Plant Fire Extinguisher Service and Issue”
OP 4002, Rev. 6, “Integrity Surveillance of Fire Detectors and Fire Suppression Systems”
OP 4019, Rev. 15, “Surveillance of Plant Fire Barriers and Fire Rated Assemblies”
OP 4103, Rev. 10, “Fire Protection Equipment Surveillance”
OP 4104, Rev. 7, “Fire Hose Hydro Test Surveillance”
OP 4210, Rev. 30, “Maintenance and Surveillance of Lead Acid Storage Batteries”

OP 4221, Rev. 8, “Surveillance of Gas Fire Extinguishing Systems”
OP 4339, Rev. 9, “Surveillance of Fire Protection Detectors/Instruments”
OP 4392, Rev. 6, “Trip Test of Fire System Water Flow Alarms”
OP 4393, Rev. 7, “Test of Cable Vault, Switchgear Rooms, and Intake Structure CO_2 System”
OP 4800, Rev. 20, “General Safety Surveillance”
OP-3126, Rev. 16, Shutdown Using Alternate Shutdown Methods
OP-5210, Rev. 10, MCC Inspections
OP-5221, Rev, 20, GE Type AK Series Circuit Breaker Inspection Calibration and Testing
OP-5227, Rev. 2, 4 kV AC Circuit Breaker Overhaul Procedure
OP-5213, Rev. 4, Inspection and Testing of Westinghouse DB Breakers
OP-5280, Rev. 1, Calibration of Basler Overcurrent Relays

Test Reports

Fire Endurance Test of 3M Interam® Mat Fire Protective Envelopes (24 in, Cable Tray, 5 in. and 1 in. Conduits, and 2 in. Air Drop into the Tray Center), Project No. 14540-98461
Fire Endurance Test of 3M Interam® Mat Fire Protective Envelopes (24 in. and 6 in. Cable Trays, 5 in., 3 in., 2 in., and 1 in., Conduits, 2 in. Air Drop and a 12 in. x 12 in. x 8 in. Junction Box), Project No. 14540-98308
BISCO Report 748-63-A, “Fire Test Utilizing SF-20 and SF-60 in Various Design Configurations”
BISCO Report 748-175, “Fire Test Configuration for a Three Hour Rated SF-60 Seal”
BISCO Report 1064-10, “Fire Test Configuration for Silcone Foam Fire Barriers in Gypsum Board Stud Partitions”
CTP-1026, June 1, 1982, “Fire Qualification Test “Hemyc” Cable Wrap System as Installed by Insulco Inc. and Affiliated Companies”
CTP-1077, March 10, 1986, “One (1) Hour Fire Test on 3 inch Conduit for NES”

Event Reports

2000-0328, 3/4/00. “Fire Brogade Spare Air Bottles”
2000-0418, 3/15/00, “Unacceptable Fire Barrier Penetration Seal”
2000-0532, 4/6/00, “Defective Protective Jacket Liner”
2000-0770, 5/15/00, “FAVP-FSAR Specifies Wrong number of Outside Fire Hydrants”
2000-0771, 5/16/00, FAVP-FSAR Specifies Incorrect FP Supply to Warehouse and Boiler Room Sprinklers”
2000-0840, 6/1/00, “FAVP - Incorrect FP Deluge System Initiating Devices Specified in FSAR”
2000-0892, 6/12/00, 6/12/00, “FAVP - Incorrect Initiating Devices for Diesel Fire Pump Fuel Oil Storage Room Identified in UFSAR”
2000-0928, 6/14/00, TRM Fire Suppression System Held Inoperative Due to Faulty Test Equipment”
2000-1048, 7/11/00, “Radio Communication Problems In Fire Drill”
2000-1105, 7/19/00, “Error in IPEEE Fire Target Set Analyses”
2000-1591, 10/19/00, Untimely Repair of Fire System Problems”
2000-1929, 12/18/00, Fire Detector Testing not Completed”
2001-0420, 3/8/01, “Hilti Holes in Fire Barrier 43"
2001-0586, 3/27/01, Minor Defects in Fire Barrier - Abandoned Hilti Holes”
2001-0587, 3/26/01, Fire Barrier 84 Defect”
2001-0718, 4/17/01, Fire Barrier Defects”

2001-1193, 5/13/01, Both Fire Pumps Taken Out Of Service"
2001-0899, 5/2/01, "Fire Door Blocked Open Without Permit"
2001-1288, 5/17/01, "Aux Transformer Deluge System Failed Test"
2001-1496, 6/20/01, "Procedural Conflicts with LCO Plan - B RHR LCO"
2001-1504, 6/21/01, "Licensing Commitment from the 1978 SER not Maintained"
2001-1518, 6/26/01, "Failure to Support Fire Brigade Activities"
2001-1517, 6/26/01, "TRM Not Met Due To ALARA Concerns"
2001-0044, 1/11/01, NCV for Failure to Consistently Use SCBA During Fire Drills"
2001-0461, 3/12/01, "Fire Brigade Training Program Does Not Meet Requirements of NFPA No. 27"
2001-0128, 01/22/01, "Maintenance Rule Commitment for Sentry Lights not Adhered too"

Quality Assurance Documents

Audit Report 99-10, Fire Protection
Audit Report VY-2000-10, Fire Protection
Audit Report VY-2001-10, Fire Protection
QA Assessment Report 2001-021
QA Assessment Report 2000-095

Self-Assessments

Security Department Self-Assessment Evaluation Form, August 16, 2000
Quarterly Observation Roll-up (6/00 - 8/00) Fire Protection
Quarterly Observation Roll-up (12/99 - 2/00) Fire Protection
Six month Self Assessment, Fire Protection (6/1/00 - 12/31/00)
Memorandum FP-99-29
Fire Protection Self-Assessment 2000-011
Re-Assessment of Electrical Raceway Fire Wraps, 8/24/94

Control Circuit and Instrumentation Drawings

B191301 Sh 309, Rev. 8, Control Wiring Diagram 4 kV Switchgear 4 Instrumentation & Relaying B191301, Sheet 751, Rev. 17, Control Wiring Diagram for Auto Blowdown System Logic "B"
B191301, Sheet 752, Rev. 15, Control Wiring Diagram for Auto Blowdown System RV2-71A
B191301, Sheet 753, Rev. 16, Control Wiring Diagram for Auto Blowdown System RV2-71B
B191301 Sh 1179, Rev. 16, Control Wiring Diagram RCIC Logic System Sheet 1
B191301 Sh 1180, Rev. 16, Control Wiring Diagram RCIC Logic System Sheet 1
B191301 Sh 1181, Rev. 19, Control Wiring Diagram RCIC Logic System Sheet 2
B191301 Sh 1182, Rev. 16, Control Wiring Diagram RCIC Logic System Sheet 3
B191301 Sh 1184, Rev. 20, Control Wiring Diagram RCIC Logic System Instrumentation
B191301 Sh 1230, Rev. 15, Control Wiring Diagram Primary Cont. Temperature Monitoring Indication and RCDR SI/NNS
B191301 Sh 1283, Rev. 10, Control Wiring Diagram Suppression Chamber Spray Upstream Valve V10-39A
B191301 Sh 1279, Rev. 10, Control Wiring Diagram Suppression Chamber Spray Spray Bypass Valve V10-34A
B191301 Sh 1271, Rev. 25, Control Wiring Diagram RHR Inboard Injection Valve V10-25A

B191301 Sh 1273, Rev. 25, Control Wiring Diagram RHR outboard Injection Valve V10-27A
B191301 Sh 1294, Rev. 19, Control Wiring Diagram RHR Instrumentation Sh 1
B191301 Sh 1295, Rev. 20, Control Wiring Diagram RHR Instrumentation Sh 2

Piping and Instrumentation Drawings

G-191159, Sh. 1, Rev. 58, "Flow Diagram Service Water System"
G-191163, Sh. 1, Rev. 33, "Flow Diagram Fire Protection System Inner Loop"
G-191163, Sh. 2, Rev. 11, "Flow Diagram Fire Protection System Outer Loop"
G-191163, Sh. 3, Rev. 3, "Flow Diagram Fire Protection System Low Pressure CO_2"
G-191163, Sh. 4, Rev. 0, "Control Room Building Cable Vault East & West Switchgear Rooms"
G-191172, Rev.60, Flow Diagram of Residual Heat Removal System
G-191167, Rev.69, Flow Diagram of Nuclear Boiler
G-191174, Sheet 1, Rev.39, Flow Diagram of Reactor Core Isolation Cooling System
G-191174, Sheet 2, Rev.23, Flow Diagram of Reactor Core Isolation Cooling System
G-191174, Sheet 1, Rev.39, Flow Diagram of Reactor Core Isolation Cooling System

Calculations

VYC-1532, Rev. O, "Verification and Validation of VY Switchgear Rooms Fire Protection CO2 System Design in Support of EDCR 96-417"
VYC-1533, Rev. 1, "VY Switchgear Rooms Fire Protection CO_2 System Concentration and Hold Times Calculation in Support of EDCR 96-417"
Fire Protection Engineering Evaluation, 08/24/94, "Re-Assessment of Electrical Raceway Fire Wraps"
Fire Protection Engineering Evaluation #18, Rev. 0, "Fire Seal Evaluation for Penetrations 35-R30316,35-R30317 and 35-R30318 Located in the One Hour Fire Rated Wall"
Fire Protection Engineering Evaluation # 28, Rev. 0, "Fire Seal Evaluation for Penetrations 35-R30323, 35-R30324, 35-R30325, 35-30326, and 35-R30327 in One Hour Rated Wall"
Fire Protection Engineering Evaluation # 35, Rev. 0, Assessment of Penetration Seals in Hollow Concrete Block Fire Rated Barriers"
Letter Dated 12/20/98, "Hose Station Hydraulic Calculation"
Letter Dated 10/22/99, "Evaluation of the 1999 Underground Hydraulic Test per OP-4105"
Calculation VYC-1087, Rev. 0, 4kV Safety Related Motor Breaker Coordination, dated April 21,1998
Calculation VYC-1087, Rev 1, 4160 VAC and 480 VAC Relay and Breaker Coordination, dated July 06, 1998.
Calculation VYC-1087, Supplement B, Attach. B, 4160 VAC and 480 VAC Relay and Breaker Coordination, dated July 20, 1999.(replaced the existing GE IAV type Overcurrent relays with Basler relays)
Calculation VYC-1188, 125 V dc system Circuit Breaker Coordination, dated September 8, 1994
Calculation VYC-1247, 120 V ac Circuit Breaker Coordination, dated April 19, 1994

Modification Documents

Minor Mod. 99-002, 3/11/95, "Switchgear/Cable Vault CO_2 System Mechanical Delay Timers"
Installation and Test Procedure for EDCR 96-417, "VY Switchgear Room CO_2 System Modification"
EDCR 96-403 dated June 10, 1996, Appendix R-SRV Hot Short Protection

Completed Tests/Surveillances

OP 4002.01, "Smoke and Heat Detectors," Completed 05/06/01
OP 4002.02, "Inspection of Fire Suppression Piping and Discharge Heads," Completed 05/06/01
OP 4019.01, "Fire Barrier, Smoke/Gas Seal and Penetration Seal Inspection Form," Completed 2001
OP 4105.02, "Fire Protection System Surveillance," Rev. 10, Completed 12/07/00
OP 4105.02, " Fire Protection System Surveillance," Rev. 9, Completed 6/15/99 & 6/29/99
OP 4221.01, "Six Month Cardox Cylinder Surveillance Data Sheet" Completed 06/13/01
OP 4339.01, " Flame and Smoke Detectors," Completed 7/26/00, 12/06/00, 01/10/01, & 01/18/01
OP 4392.01, "Trip Test of Fire System Water Flow Alarms," Completed 04/05/01 & 04/25/01
OP 4393.01, "Cable Vault CO2 System Data Sheet," Completed 03/08/01
OP 4393.02, "West/East Switchgear Room CO_2 System Data Sheet," Completed 03/08/01
OP 4393.03, "Testing of East/West Switchgear Room Mechanical Timers," Completed 03/02/01
OP 4393.04, "East/West Switchgear Room Simulated Flow Test," Completed 03/09/01 & 03/15/01
OP 4393.06, "Low Pressure CO_2 Restoration," Completed 03/02/01 & 03/08/01
OP 4800.07, "Emergency Battery Lights (Procedure A)
OPF 4142.02, Rev. 7, Vernon Tie Alternate Shutdown Capability Test, dated May 14, 2001

Work Orders

WO 01-000616-000, 02/09/01, "Replace Batteries for Diesel Fire Pump"
WO 01-000193-000, 01/12/01, "Replace Batteries for Diesel Fire Pump"
WO 01-000108-000, 04/26/01, "Quarterly Battery Surveillance"
WO 00-000106-000, 04/26/01, "Quarterly Battery Surveillance"
WO 00-006956-000, 04/09/01, "Perform Fire Battery 6 Month Check"
WO 00-005665-000, 12/31/00, "Annual Pilot Cell Assignment"
WO 00-005664-000, 12/31/00, "Annual Pilot Cell Assignment"
WO 00-000827-000, 01/23/01, "Replace Batteries for Diesel Fire Pump"
WO 99-004763-000, 08/31/99, "5 Year Fire Battery Replacement West Switchgear Room"
WO 99-004762-000, 08/31/99, "5 Year Fire Battery Replacement Cable Vault"
WO 99-003798-000, 07/31/99, "5 Year Fire Battery Replacement East Switchgear Room"
Preventive Maintenance Change Request 2001-250, "Replace Batteries in Appendix R Sentry Lights"
Preventive Maintenance Change Request 2001-251, "Perform Monthly Surveillance of Emergency Raceway Fire Wraps"
WO 00-3169-074, Instantaneous/Time Overcurrent Relay Servicing 3V4 (vernon Tie) Phase C
WO 00-3169-075, Instantaneous/Time Overcurrent Relay Servicing 3V4 (vernon Tie) Phase B
WO 00-3169-076, Instantaneous/Time Overcurrent Relay Servicing 3V4 (vernon Tie) Phase A

WO 00-3169-017, AC Time Current Relay Servicing 3T1, Phase C
WO 00-3169-018, AC Time Current Relay Servicing 3T1, Phase B
WO 00-3169-019, AC Time Current Relay Servicing 3T1, Phase A
WO 98-1225-000, Instantaneous/Time Overcurrent Relay Servicing RHR feeder breaker P-10-1A Phase A
WO 98-9211-000, Instantaneous/Time Overcurrent Relay Servicing RHR pump feeder breaker P-10-1A Phase B
WO 00-3169-035, Instantaneous/Time Overcurrent Relay Servicing RHR pump feeder breaker P-10-1A Phase A
WO 00-3169-034, Instantaneous/Time Overcurrent Relay Servicing RHR pump feeder breaker P-10-1A Phase C
WO 99-11628-000, Undervoltage Relay-Bus 4
WO 99-11657-000, Time Delay Relay servicing Bus 4 Degraded Grid Undervoltage 62-4
WO 99-11658-000, Time Delay Relay servicing Bus 4 Degraded Grid Undervoltage 62-4Z
WO 99-11659-000, Time Delay Relay servicing Bus 4 Degraded Grid Undervoltage 62-4W
WO 98-7627-001, Switchgear 4 Compartment 5 Servicing RHR feeder P-10-1A
WO 98-7626-000, Switchgear 4 Compartment 4 Servicing Core Spray Pump Feeder P-46-1A
WO 97-6314-000, Switchgear 9 Compartment 4B, Breaker 99 Feed from SS
WO 98-7736-000, Switchgear 9 Compartment 6C Servicing UPS-1A
WO 99-10975-000, Switchgear 9 Compartment 7B servicing MCC 9C, in a DG Room
WO 98-7736-001, 480 Volt AK25 Breaker
WO 00-1444-000, DC-1AS Distribution Panel
WO 97-6512-000, MCC DC 2B Compartment E Servicing RCIC Steam to Turbine Valve V13-131
WO 99-0217-015, 4 kV Switchgear 4 , Dc 70 Amp Breaker PM

Miscellaneous Documents

Vendor Manual, Exide Lightguard (Appendix R Lights)
Fire Impairment Log, 02/22/01 - 06/25/01
IN 92-28, “Inadequate Fire Suppression System Testing”
IN 95-52, “Fire Endurance Test Results for Electrical Raceway Fire Barrier Systems Constructed From 3M Company Interam Fire Barrier Materials”
Final Report Prepared by Retrotec Energy Innovations Ltd., “Room Integrity Testing of Vermont Yankee Cable Spreading”
Letter from the NRC, September 12, 1979, “Requires 5 Man Fire Brigade”
Letter from the NRC, July 3, 1980, “Concluded Adequate Shutdown Capability does not Exist”
Letter from the NRC, November 29, 1990, “Alternative Testing Method for Cable Vault CO_2 Fire Suppression System for Vermont Yankee Nuclear Power Station”
Letter from the NRC, March 23, 1997, “Exemption from Requirements of Section III.J of 10 CFR Part 50, Appendix R”
Letter from the NRC, June 9, 1997, “Exemption from Section III.G”
Letter from the NRC, August 12, 1997, “Exemption from III.G and III.L”
Letter from the NRC, April 6, 1998, “Amends TS Section 3.13.G.1 and 3.13.G.2 Regarding Foam for MG Sets”
Letter from the NRC, March 6, 1998, “Amends TS Sections 3.13/4.13 to Address New CO_2 System”
Letter from the NRC, September 2, 1998, “Removal of Fire Rating on Control Room/Cable Vault Electrical Penetration Barrier”

Penetration Data Sheet for 35-R30318, 11/05/98
Penetration Data Sheet for 35-R30323, 01/14/98
Penetration Data Sheet for 38-T10429, 11/23/98
SER, January 13, 1978
SER, October 24, 1980
SER, January 13, 1983
TIA, February 17, 1999, "Proposed TIA for Acceptability of CO_2 Total Flooding Fire Suppression System Testing Without Full Discharge Test"
Letter Dated November 17, 1999, "Proposed TIA Regarding the Acceptability of CO_2 Total Flooding Fire Suppression Systems Testing Without Full Discharge Test"
VY Maintenance Rule- State of the System Report Sentry Lights, 03/31/01

Miscellaneous Drawings

B-191500, Sh. 267, Rev. 1, Fire Barrier Seal Drawing Fire Barrier No. 35"
B-191500, Sh. 272, Rev. 1,Rev. 1, Fire Barrier Seal Drawing Fire Barrier No. 38"
G-191328, Sh. 1, Rev. 3, "Fire Protection Conduit Control Building"
G-191328, Sh. 2, Rev. 4, "Fire Protection Conduit Control Building"
G-191328, Sh. 3, Rev. 2, "Fire Protection Conduit Control Building"
G-191334, Sh. 1, Rev. 1,"Reactor Building - Plan 4 Fire Protection"
5920-11896, Sh. 1, Rev. 2, "Control Room Building East & West Switchgear Rooms Low Pressure CO_2 Suppression System"
5920-11896, Sh. 2, Rev. 1, "East Initial Discharge For CO_2 Low Pressure Suppression System"
5920-11896, Sh. 3, Rev. 1, "Control Building East & West Switchgear Rooms Low Pressure CO_2 Suppression System"
5920-11896, Sh. 4, Rev. 2, "Control Building East & West Switchgear Rooms Low Pressure CO_2 Suppression System"
5920-11896, Sh. 5, Rev. 2, "Control Building East & West Switchgear Rooms Low Pressure CO_2 Suppression System"
5920-11896, Sh. 6, Rev. 1, "East Extended Discharge for CO_2 Low Pressure Suppression System"
5920-11896, Sh. 7, Rev. 1, "West Initial Discharge for CO_2 Low Pressure Suppression System"
5920-11896, Sh. 8, Rev. 1, "West Extended Discharge for CO_2 Low Pressure Suppression System
5920-11896, Sh. 9, Rev. 1, "Header/Tank Connection for CO_2 Low Pressure Suppression System"
5920-11896, Sh. 10, Rev. 0, "Control Room Building Cable Vault High Pressure CO_2 Suppression
5920-11896, Sh. 11, Rev. 0, "Control Room Building Cable Vault High Pressure CO_2 Suppression System Piping Plan"
G-191298, Sheet 1, Rev.26, Main One Line Wiring Diagram (345 kV and 115 kV Yard)
G-191298, Sheet 3, Rev. 0, Main One Line Wiring Diagram (4kV Vernon Tie & Switchyard)
G-191301, Sheet 1, Rev. 12, 480V Aux. One line Diagram SWGR Bus 9, MCC 9A, 9C
G-191301, Sheet 2, Rev. 17, 480V Aux. One line Diagram MCC 9B, 9D, 89A
G-191372, Sheet 4, Rev. 17, 120/240 V Vital AC and Instrument AC One line Diagram.
G-191372, Sheet 3, Rev. 14, 125V DC One Line Diagram (DC-2AS)
G-191372, Sheet 1, Rev. 54, 125V DC One Line Diagram (125 V DC, MCC DC-2B (RCIC)
G-191372, Sheet 1, Rev. 54, 125V DC One Line Diagram (125 V DC, MCC DC-2B (RCIC)
A-191353, Sheet DC-1AS, Rev. 1, Power Distribution Panel Schedule for Panel DC-1AS

G-191397, Sh 1, Revision 12, Cable Vault Tray Plan
G-191334, Sh 2, Revision 08, Reactor Building-Plan 4 Conduit Trays and Grounding
G-191324, Sh 1, Revision 44, Cable Vault arrangement Switchgear Rm. Conduit and Tray s
B-191301, Sh 1184A, Rev. 7, Cable and Conduit List
B-191301, Sh 1184R, Rev. 9, Cable and Conduit List