U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No.	91-29
Docket No.	50-271
Licensee No.	DPR-28
Licensee:	Vermont Yankee Nuclear Power Corporation RD 5, Box 169 Ferry Road Brattleboro, VT 05301
Facility:	Vermont Yankee Nuclear Power Station Vernon, Vermont
Inspection Period:	November 26 - December 31, 1991
Inspectors:	Harold Eichenholz, Senior Resident Inspector Paul W. Harris, Resident Inspector Mark Miller, Resident Inspector, Yankee Rowe
Approved by:	John F. Rogge, Chief, Reactor Projects Section 3A — Date: 1/21/92

Inspection Summary: This inspection report documents resident safety inspections conducted between November 26 - December 31, 1991. Station activities inspected during this period included: plant operations; radiological controls; maintenance and surveillance; emergency preparedness; security; engineering and technical support; and safety assessment and quality verification.

Results: Inspection results and conclusions are summarized in the attached Executive Summary.

EXECUTIVE SUMMARY

Vermont Yankee Nuclear Power Station
Report No. 50-271/91-29

Plant Operations

A review of Vermont Yankee's response and actions to spurious recirculation pump annunciators concluded that the response was consistent with the low safety significance of the identified conditions. Control room activities during the power reduction for an on-line steam leak repair were professional and effectively mitigated a spurious increase in recirculation pump flow. Control room personnel and fire brigade members effectively responded to a main transformer fire deluge system actuation.

Radiological Controls

Appropriate and timely corrective actions were taken when a radioactive particle was found imbedded in the base of a radioactive material shipping cask. Effective radiological assessment and survey support was provided to the activities surrounding the fire involving a truck carrying unirradiated nuclear fuel. Supplemental corrective actions were reviewed regarding NRC concerns involving a prior event of personnel failure to frisk when exiting a radiation control area.

Maintenance and Surveillance

A review of Vermont Yankee's response to rain water leakage into the diesel generator rooms concluded that the corrective actions taken were appropriate. Maintenance activities associated with a steam leak were planned and controlled. Actions taken to ensure personnel safety during this repair were commendable. The overall conduct of numerous surveillance tests was good. Missed surveillances involving daily instrument checks were reviewed and an Unresolved Item (91-29-01) was identified.

Emergency Preparedness

Vermont Yankee provided timely and effective assistance to assess and mitigate the potential radiological concerns from a fire involving a truck transporting unirradiated nuclear fuel to Vermont Yankee. Responding Vermont Yankee personnel were professional and well equipped.

Security

Vermont Yankee opened Gatehouse 2 to allow access to and egress from the Protected Area and closed Gatehouse 3. This effort was well controlled and received a high level of management involvement and oversight.

Engineering and Technical Support

Vermont Yankee's Failed Fuel Action Plan was reviewed and found to be thorough and well implemented. Response to elevated offgas activity levels has been conservative and information has been promulgated to appropriate levels of management. Actions taken to resolve a condition of unanalyzed loads on safety class piping were appropriate.

Safety Assessment and Quality Verification

The participants at the Plant Operations Review Committee meeting held to discuss the on-line repair of a steam leak exhibited a conservative safety perspective with regard to personnel safety and plant operations.

TABLE OF CONTENTS

Table of Contents

ATTACHMENTS

DETAILS

1.0 SUMMARY OF FACILITY ACTIVITIES

Vermont Yankee Nuclear Power Station (VY) operated at full power throughout most of this inspection period. Minor rod pattern adjustments were made to improve core thermal performance as the core approached end of full power life. Reactor coastdown is expected to begin around January 11. Offgas activities ranged in value between 50,000 to 60,000 μCi/sec. On December 30, 1991 VY entered Level V of their Failed Fuel Action Plan. This level, in part, requires VY to evaluate the prudency of a power reduction or an early shutdown.

Activities to clean up the fuel pool of high level radioactive waste had been completed for this time. New fuel and fuel channel inspections are on-going. On December 16, 1991, a truck carrying unirradiated nuclear fuel was involved in an accident in Springfield, MA and caught fire. This event involved emergency response from VY, the Commonwealth of Massachusetts, and local authorities. The event was of significant media attention. On December 19, 1991, power was reduced to approximately 65 percent for the repair of a steam leak in the turbine building's heater bay area.

The selection of Mark Mervine as Training Manager of the Training Department became effective December 30, 1991. Mr. Mervine will be responsible for VY technical and operational training of VY employees and simulator operations. The Training Manager reports directly to the Senior Vice President, Operations.

2.0 PLANT OPERATIONS (71707, 93702)

2.1 Inspection Activities

The inspector verified that the facility was operated safely and in conformance with regulatory requirements. Management control was evaluated by direct observation of activities, tours of the facility, interviews and discussions with personnel, and independent verification.

2.2 Inspection Findings and Significant Plant Events

2.2.1 Recirculation Pump Annunciators

In reviewing daily operations reports, the inspector noted several maintenance requests (MR) addressing spuriously alarming reactor recirculation pump (RRP) annunciators. In reviewing selected MRs, the inspector found that alarms involving the parameters of vibration, temperature, oil level, seal pressure and cooling water flow occurred. These parameters do not provide reactor safety functions, but provide indications of potential problems with maintaining forced circulation in the reactor core.

The inspector questioned instrumentation and control (I&C) department personnel as to root causes for the alarms and was satisfied that failure mechanisms and alarm conditions were understood. Of particular note was the discovery that the "A" RRP instrumentation terminal box

was effected by moisture which led to a number of spurious alarms. It was found that leakage past the lower containment spray header isolation valves resulted in dripping from several spray nozzles, which impinged on instrumentation conduit and traveled down the conduit onto and into the terminal box. The moisture entering the terminal box was sufficient to create grounds which brought in alarms. The inspector questioned VY's ability to differentiate between spurious and valid alarms under these circumstances and was shown how resistance checks and meggering were used to validate alarm conditions. The inspector was satisfied that the methods described in concert with diverse indications of pump performance, were adequate. While the drywell was not accessible for inspection, the inspector reviewed photographs of the effected areas and was satisfied that the root causes relating to moisture-induced spurious alarms had been properly characterized. VY's corrective actions for moisture-induced alarms included installation of Temporary Modification 90-12, which placed a drip pan (directing leakage to the torus) between the spray header and the conduit. Additionally, a Plant Design Change Request 91-002 is being developed which will replace the existing containment spray valves and which will install a drain line in the low point of the lower containment spray header to direct any isolation valve seat leakage to the suppression pool before leakage out of spray nozzles occurs. This work is scheduled for the 1992 outage.

The inspector concluded that VY had adequately addressed the reviewed cases of spurious annunciators and had responded in a manner consistent with the safety significance of the conditions.

2.2.2 **Power Reduction for Steam Leak Repair**

On December 19, 1991 at approximately 12:00 p.m. with the plant at 100 percent of rated power, VY reduced power at 1 percent per 3 minutes to a final power level of 65 percent of rated power. This power change was performed to support the repair of a steam leak in the condenser bay of the turbine building. This repair is discussed in Section 4.2.2

Control of reactor operations during the power change was good. This control was demonstrated by control room operators recognizing a fluctuation in reactor recirculation flow and taking prompt effective action to mitigate the subsequent plant transient. The change in recirculation flow of approximately 5 percent caused a 2 inch reactor vessel level change and a 12 percent reactor power change. No Technical Specifications (TS) reactor thermal or administrative limits were exceeded.

The cause of the change in recirculation flow was attributed to foreign material build-up on the recirculation pump speed control potentiometer. Control room operators exercised the flow controller, verified system response, and returned the controller to normal operation. The operators then monitored the system closely. The system operated as designed and another unexpected flow change was not experienced. This event was determined by VY to not be reportable.

Operator knowledge was considered good and management oversight was observed to be excellent during the steam line repair. Continuous communications with the repair team was maintained, and a video camera monitoring the work provided control room operators real-time information regarding repair status. In addition, control room night order entries, highlights in the Daily Operations Report, senior supervisor meetings, a Plant Operations Review Committee (PORC) meeting, and prompt notification of supervisors and plant management all contributed to excellent oversight that resulted in safe operation during the repair of the steam line leak.

2.2.3 **Main Transformer Fire System Actuation**

On December 18, 1991 at 7:24 p.m., a fire alarm and fire pump actuation annunciators sounded in the control room to indicate actuation of the main transformer fire deluge system. The plant was at 100 percent of rated power, the Plant Manager was in the control room, and shift turnover was in-progress at the time of this event. The fire brigade responded, reported no fire, and reset the deluge system. The cause of the system actuation was snow accumulation on the manual initiation pull box for the main transformer deluge system. This occurred during snow removal activity in the vicinity of the pull box. The determination of root cause and corrective action has been assigned, however, has not yet been completed. A maintenance request had been generated to install a protective covering on the main and auxiliary transformer fire deluge system actuation boxes to prevent recurrence of unanticipated pull box actuation. No off-site fire department response was requested or required. This event was not reportable and no adverse impact on plant operations was noted.

The effects of main transformer fire deluge system operation during plant operations has been a recognized industry concern. Industry Significant Event Report (SER) No. 91-17, "Inadvertent Transformer Fire Protection Deluge Actuations" as well as other Electric Power Research Institute and industry documents discuss the causes and effects of inadvertent fire protection deluge system actuations on electrical transformers. The nuclear industry has experienced reactor scrams, partial or complete losses of off-site power, electrical grid transients effecting the other units at a multiple reactor site, and unanticipated interactions of fire and deluge systems. Utility efforts to mitigate and prevent recurrence have focused on personnel training, fire system design, preventive maintenance, and scheduling.

VY has experienced two previous inadvertent actuations of main transformer deluge systems. These occurrences did not effect reactor operations. VY actions to review this issue have focused on a recently conducted plant review of SER 91-17 and recommendations that have centered on enhancing preventive maintenance and scheduling activities. The training of control room operators already incorporates lessons learned from industry events.

Actions taken thus far by VY, based on the minimal safety significance of this issue and recent plant and industry experience, appear to be appropriate. However, continued emphasis on improvements in maintenance practices in and around fire systems and increased worker sensitivity of the effects of inadvertent fire system actuations appear to be warranted. The Plant Manager (PM) observed that the actions taken by the control room personnel during the

December 18, 1991 actuation were effective and timely, and that control room personnel were communicating in a concise manner. This comment by the PM reflects current sensitivity to NRC concerns involving identified weaknesses in licensed operator communication and crew interactions.

2.2.4 Plant Operational Observations

The inspectors observed on-site activities involving the receipt of unirradiated nuclear fuel. Unpacking, transportation, and inspection of the fuel was well controlled, including activities on and off the refuel floor. The qualification process of the VY fuel inspectors was observed to be thorough and of sufficient detail to provide reasonable assurance that the new fuel inspectors would ensure that the fuel would be acceptable for use.

The inspectors observed plant operations during frequent tours of the reactor and turbine buildings. The work associated with the fuel pool cooling system modification has proceeded without any notable problems. Housekeeping in these areas was generally very good. Control room operators exercised effective control during power maneuvers and surveillance activities. The inspectors reviewed control room logs, operating orders, annunciators, recorder traces, area radiation and process monitors, and auxiliary operator logs and found no significant discrepancies.

Backshift and deep backshift inspections were conducted during this inspection period. Control room operators were alert, attentive, and responded accordingly to annunciators and plant conditions.

3.0 RADIOLOGICAL CONTROLS (71707, 93702)

3.1 Inspection Activities

The inspector frequently toured the Radiation Controlled Area (RCA) and assessed the implementation of the radiological protection program.

3.2 Inspection Findings and Review of Events

3.2.1 Routine Observations

Effective radiological control practices were observed during the repair of the steam leak in the condenser bay, documented in Section 4.2.2, and new fuel receipt inspections and crane maintenance on the refuel floor. Housekeeping, control of personnel, and radiological documentation in the RCA were good. Radiological postings and personnel radiation monitoring activities within the reactor building were satisfactory. Overall, good radiological practices were observed.

3.2.2 **Radioactive Particle Found on Shipping Cask**

On November 22, 1991, a radioactive particle was found imbedded in the base of a radioactive material (RAM) shipping cask. The particle, which emitted a very narrow radiation stream was discovered during the RAM receipt inspection of the cask. This inspection was performed in accordance with VY procedure AP 0523, Rev. 0, "Receipt of Radioactive Materials."

This type of RAM shipping cask is used to transport highly radioactive waste to disposal facilities. The cask was mounted on the flat bed of a tractor trailer and enclosed by a personnel barrier attached to the truck bed. The cask originated from Chem-Nuclear System, Incorporated (CNSI) in South Carolina and was placarded as a Department of Transportation (DOT) Radioactive Yellow II shipment. This placard requires contact dose rates be < 50 mr/hr and dose rates at 3 feet be < 1 mr/hr.

The radiation survey performed on the exterior surface of the personnel barrier indicated normal background radiation levels. In addition, no loose surface contamination was found. However, surveys taken at the surface of the shipping cask above the radioactive particle, identified dose rates of 1.5 R/hr gamma contact, and 2 R/hr beta and 1.8 mr/hr at 3 feet. Based on these surveys, VY identified several possible infractions of DOT regulations involving placarding of this shipment. VY notified the DOT and CNSI of these findings. Furthermore, VY determined that there was no radiation hazard presented to the public during the transportation of this cask, since the personnel barrier prevented access to the radioactive particle. In addition, since the particle was deeply imbedded and significant effort was required for it to be removed, there was very little possibility of the particle becoming dislodged during transportation. This particular cask was utilized in a recent shipment of material from VY, was immersed in the spent fuel pool (SFP) during filling which is when the particle could have potentially been imbedded in its bottom and was surveyed prior to leaving VY and was receipt inspected at the disposal site by CNSI. There was no conclusive evidence that the activation particle was from the VY SFP.

VY's immediate and subsequent actions were appropriate. Surveys and radiological practices were prompt and effective. Timely communications with radiation protection department supervisors and the control room were made and resulted in a well-controlled effort to decontaminate the cask. The control room made a prompt one-hour notification per 10 CFR 20.205 to the NRC Operations Center based on preliminary surveys. A subsequent review of this event by VY determined that this event was not reportable. Follow-up actions included: (1) detailed surveys and decontamination as necessary of the cask and truck bed, (2) appropriate radiological control postings, (3) conversations with CNSI and DOT, (4) a commitment to include this event in radiological control classroom training, and (5) placing a protective liner around the cask at the time of lowering it in the SFP for filling. This event was not reportable.

3.2.2 **Personnel Frisking Practices When Exiting Radiological Control Areas**

NRC Inspection Report 91-28 documented concerns involving an individual exiting the RCA without performing a whole body frisk. During this inspection period, VY corrective actions were reviewed.

The inspector reviewed the RP technician training plan and the procedure revision (Rev. 19) to RP 45??, "Personnel Monitoring When Exiting Posted Areas" and found them adequate to prevent recurrence. Specifically, the procedure revision and a memorandum to site personnel appears to remove ambiguity and confusion regarding frisking requirements. The inspector had no further questions on the item.

4.0 MAINTENANCE AND SURVEILLANCE (62703, 61726, 92700)

4.1 Maintenance Inspection Activity

The inspector observed selected maintenance activities on safety related equipment to ascertain that these activities were conducted in accordance with approved procedures, TS, and appropriate industry codes and standards.

4.2 Maintenance Observations

4.2.1 Leakage into Diesel Generator Rooms

NRC Inspection Report 91-03 described VY's response to roof leaks identified in the "B" emergency diesel generator (EDG) room and characterized VY awareness and actions as indicating a proper level of concern and good safety perspective. Inspection Report 91-11 recounted the replacement of the EDG roof, and VY's actions were determined to be well controlled and conservative. During the current reporting period, the inspector performed a followup review of VY's corrective actions to assess adequacy. Additionally, this review was prompted by an October 16 incident in which leakage into the "A" EDG room resulted in a ground of the EDG DC control bus.

The "A" and "B" EDGs are located in adjacent rooms. The "A" EDG is located within the turbine building boundary beneath the turbine building ventilation supply room (TBVSR), while the "B" EDG is located outside the turbine building boundary with its own roof. Water has leaked into the "B" EDG room in the past due to roof leakage. Following the replacement of roofing over the "B" EDG room, one leak was identified and was traced to an inadequately sealed seam in the new roof. VY personnel indicated that, following seam repair, no additional leakage was noted. The inspector toured the "B" EDG room and the roof and noted that, while some low-lying portions of the roof (in the vicinity of the seam in question) contained standing water from a recent rain, no leakage was apparent in the "B" EDG room. The inspector further noted that there was no indication of recent leakage (i.e. puddles, water stains on floor surfaces) in the "B" EDG room.

The TBVSR, located directly over the "A" EDG room, and a portion of the condensate/demineralizer hall; contains, in part, the turbine building air intake structure, supply fans, and a potable water storage tank and transfer pumps. The potable water system draws water from the wells located on-site. Recently, well water usage has resulted in high levels of sand accumulating in the potable water storage tank. To correct this condition, operations

personnel drained the tank in an effort to remove sand. The drain line used for this evolution runs from the storage tank to a local floor drain. In the course of the draining evolutions, enough sand accumulated in the drain system to prevent subsequent water flow. In October, rainwater entering the room through ventilation dampers accumulated due to the clogged drain line. This created a volume of standing water on the concrete floor in the turbine building ventilation room. Previously existing cracks in the floor allowed the standing water to leak into the "A" EDG room, where it impinged on the EDG control panel, leaked into the panel, and created a grounded condition on one DC bus. The ground detection meter in the control room alerted operators to the condition. Corrective actions included removing the water from the TBVSR, hydrolyzing the drain to remove the blockage, inspection and hydrolyzing of all plant drain lines during each refueling outage, and sealing the TBVSR floor with and epoxy-based, waterproof, floor surface material. VY stated that, following the resurfacing of the floor, a standing water test was performed and that no leakage was identified.

The inspector toured the ventilation rooms above the turbine building condensate/demineralizer hall and "A" EDG room and found that the TBVSR floor had been completely coated as described, including the cinder block walls up to approximately 6 inches above floor level. It was noted that a length of open-ended pipe penetrated the floor, creating a condition of communication between the room and the condensate/demineralizer hall below. The pipe's length above the floor was approximately 4 inches, and the inspector concluded that, should another drain line blockage develop, water would accumulate until it reached the top of the pipe and would then begin to flow through the penetration to the space below. The inspector surveyed the area of the condensate/demineralizer hall below the pipe and found it to contain a chemical storage bin and portable heating/ventilation and air conditioning equipment. The inspector concluded that leakage into this area from the room above would not adversely impact plant equipment.

Given the differences in arrangement between the EDG rooms, and the root cause for the leakage discovered in each room, the inspector concluded that the conditions would not result in common mode failure concerns. In each case, the inspector concluded that VY corrective actions were appropriate.

4.2.2 **On-Line Repair of Steam Line Leak**

On December 15, 1991, during the weekly tour of the condenser and feedwater heater bays, the Auxiliary Operator (AO) observed a steam leak near an elbow on the sixth stage extraction steam line from the high pressure turbine. The leak was on a bypass valve steam leak off line that is 2 inch diameter, schedule 80, carbon steel piping. The AO's observation was promptly reported to the control room Shift Supervisor. The Plant Manager and Operations Department Supervisors were informed early on Monday, December 16, 1991. These notifications were considered timely and appropriate.

Beginning on December 16, 1991, VY started to take decisive and appropriate actions to address the steam line leak. Almost immediately, a video camera was placed near the steam leak to allow continuous monitoring by the control room operators. This allowed VY to determine that the steam line pipe leak was not increasing in size. Three of VY's significant goals regarding this repair were to: (1) determine the significance of this leak on plant operations; (2) decide whether an on-line, reduced power, or shutdown repair would be most beneficial and/or prudent; and, (3) ensure personnel safety.

VY recognized that the size and location of the steam leak and the pressure of the steam system did present challenges to actual repair activities. A thorough review of the engineering aspects, plant conditions, and personnel safety considerations of the repair were considered by VY to be important on deciding the appropriate repair scenario. From the very onset of this event, VY stressed that safety was the primary factor and then continued, in an exceptionally detailed process, to review the different repair scenarios. VY demonstrated sensitivity to the effect of these scenarios on industrial safety, As Low As Reasonably Achievable (ALARA) radiological considerations, current condition of the fuel, electrical grid stability, and transient effects on the plant. In addition, VY reviewed and implemented:

-- previous VY experience in this type of repair
-- the history and physical characteristics of the leak
-- previous industry experience
-- erosion/corrosion information on this system piping
-- jet force calculations for catastrophic pipe failure
-- hanger/dead weight analysis
-- environment assessment
-- job safety plans
-- temporary modifications package
-- ALARA work exposure review
-- hold points and contingency plans

These activities to support the repair process were thorough and of sufficient detail.

A PORC meeting, held prior to the decision to repair the leak, was exceptionally well organized and reviewed these items in a thorough and probing manner. The meeting included appropriate contractor and VY departments, the VY Safety Coordinator, and engineering support from Yankee Nuclear Services Division (YNSD). Ardent discussions ensued that encouraged the identification and resolution of potential safety issues.

VY decided to perform an on-line repair of the steam leak at approximately 65 percent of rated power using a commercial leak repair process. An on-line repair at this power level was determined to provide the best plant conditions to support the repair (low dose rates, low steam line steam line system pressure, and minimal plant and fuel transients) bounded by reasonable

assurance of plant and personnel safety. Steam pressure at the leak at the time of repair was approximately 110-120 pounds and the steam plume was approximately 3-5 feet long fanning out to 1 or 2 feet. The complete maintenance process took approximately 9 hours.

The planning and control of maintenance activities for this repair were excellent. Management and first-line supervisors ensured that: (1) work-site and supervisory medical assistance was available for the duration of the repair; (2) staging and equipment to support the maintenance was ready, thereby preventing significant delays; (3) contractors and VY maintenance personnel were properly briefed as to repair expectations and personnel safety considerations; (4) additional engineering expertise was available and used; (5) that radiological controls and practices minimized and accurately estimated personnel exposures; and (6) detailed safety assessments were performed.

Overall, VY exhibited a proper safety perspective during the repair of the steam line leak and provided reasonable assurance that personnel and plant safety would not be compromised. Excellent initiatives such as stand-by medical help, procedural hold points to assess personnel safety with respect to pipe integrity, providing a knowledgeable senior operator in the work area to directly communicate with the control room, and stand-by maintenance personnel to render immediate assistance all helped ensure personnel safety and were considered by the NRC to be commendable.

4.3 Surveillance Inspection Activity

The inspector performed detailed procedure reviews, witnessed in-progress surveillance testing, and reviewed completed surveillance packages. The inspector verified that the surveillance tests were performed in accordance with TS, approved procedures, and NRC regulations.

4.4 Surveillance Observations

4.4.1 Routine Surveillance Testing Activity

The inspector observed the following surveillance tests in the control room and/or at the location of the equipment tested:

OP 2125, Rev. 14, "Containment Atmospheric Dilution System,"

OP 4344, Rev. 6, "Drywell H_2/O_2 Monitor Functional Calibration,"

OP 4210, Rev. 18, "Maintenance and Surveillance of Lead Acid Storage Batteries,"

OP 4121, Rev. 28, "Reactor Core Isolation Cooling System Surveillance,"

OP 4120, Rev. 24, "High Pressure Coolant Injection System Surveillance,"

OP 4338, Rev. 20, "Drywell High Pressure ECCS Functional/Calibration,"

OP 4126, Rev. 27, "Diesel Generators Surveillance,"

OP 4116, Rev. 12, "Secondary Containment Integrity Capability Check,"

OP 0630, Rev. 14, "Water Chemistry,"

OP 0634, Rev. 3, "Operation of Dionex 2020I Ion Chromograph,"

OP 0631, Rev. 10, "Radiochemistry."

The inspector observed that the tests were well controlled by operators and the technicians. The surveillance tests were performed by qualified and knowledgeable personnel and were conducted using calibrated equipment. Overall, the conduct of testing was considered good and was determined to meet the safety objective of the surveillance testing program.

4.4.2 **Missed Technical Specification Surveillances**

During this inspection period, VY identified three TS daily instrument checks that did not meet TS requirements. The first two instrument checks, containment Hydrogen/Oxygen (H_2/O_2) instrument (SR-VG-6A/B) and torus pressure indicator (PI-16-19-36A/B), were not performed on the TS required instruments. The third daily check, containment high range radiation monitor (RM-16-19-1A/B), was not being performed on the correct indicator.

These instruments, part of post-accident monitoring instrumentation required by TS Table 3.2.6, display information in the control room necessary for operators to initiate and control the systems used during and following a postulated accident. The instruments are demonstrated operable by the performance of an instrument check specified in TS Table 4.2.6 which, in part, is a qualitative determination of operability through observation and comparison. VY satisfies instrument check requirements through log taking every 8 hours in accordance with their procedure AP 0150, Rev. 27 "Responsibilities and Authorities of Operations Department Personnel."

On December 13, 1991, the Shift Supervisor (SS) identified the problem with the first of the three missed TS surveillances. The SS noted that TS Table 3.2.6, "Post-Accident Instrumentation" inaccurately listed the containment H_2/O_2 monitors as "Meter SR-VG-6A" and "Meter SR-VG-6B." The meters are labeled SR-VG-5A/B, whereas, the instrument designation SR-VG-6A/B refers to the H_2/O_2 recorder. The SS questioned which instrument, meter or recorder, was the TS required instrument.

On December 18, 1991, VY determined, based on a review of NUREG 0737 and Regulatory Guide 1.97 related licensing documents, and previous work associated with VY control room enhancements, that the recorder was the TS required instrument. VY also identified, as part of

initial corrective actions, two additional instrument checks involving torus pressure indicator and containment high range radiation monitors, that were not performed per TS requirements. Initial corrective actions were timely with appropriate surveillances being performed.

Pending the release of the VY Licensee Event Report (LER), the missed TS surveillances remains an Unresolved Item (UNR 91-29-01).

5.0 EMERGENCY PREPAREDNESS (71707)

5.1 Fire Involving Truck Transporting New Fuel to Vermont Yankee

At approximately 4:00 a.m. on December 16, 1991 a truck traveling north on Interstate 91 in Springfield, Massachusetts, carrying 12 shipping containers (24 fuel bundles) of unirradiated low enriched fuel, was struck head-on by an automobile traveling south in the north-bound lanes. The fire that ensued destroyed the truck and completely burned the wooden shipping crates that enclosed the reinforced metal shipping canisters. It was these shipping canisters that held and protected the new fuel. Eight of the 12 shipping canisters ended up on the highway next to the trailer. The remaining four were still on the trailer. Some of the canisters were slightly deformed, various canister bolts were sheared, the rubber gasket material between the canister lid and body was melted, numerous canister bolts were sheared or bent, and various canister pressure relief plugs were missing.

Detailed radiological surveys were performed by response members from VY and the Commonwealth of Massachusetts. Surveys included beta-gamma and alpha radiation measurements and loose surface contamination surveys in the immediate area, on the shipping canisters and truck, and downwind. No elevated radiation levels or radioactive contamination was found. The survey results indicated that the fuel was intact and not breached.

The fire was allowed to burn itself out and then was finally extinguished using dry chemicals. The shipping canisters were then allowed to cool naturally. At approximately 4:00 p.m. that same day, the shipping canisters were loaded onto flat bed trucks and shipped to Westover Air Force Base in Chicopee, Massachusetts for inspection and repackaging. Representatives from the fuel supplier, General Electric (GE) of Wilmington, North Carolina, arrived at Westover and conducted this inspection and repackaging effort. On December 18, 1991 at approximately 10:00 a.m. the fuel was transported on flat bed trucks escorted by security guards to GE in Wilmington, NC. The fuel safely arrived at approximately 10:00 a.m. on December 19, 1991.

Response to this event by VY was commendable. VY assistance during the initial radiation surveys indicated that the fuel was not breached and that there was no radiological danger to the public. VY also assisted in the detailed radiological surveys of the shipping canisters prior to their shipment and the activities associated with transporting the canisters to Westover. Efforts taken by VY personnel supported fuel transportation activities and provided engineering assistance.

Actual participation by the NRC at the accident during this event involved monitoring, assessing, and providing advice. The NRC Region 1 Office staffed and utilized the Incident Response Center. The NRC resident inspector at VY and an NRC transportation specialist/health physicist were at the accident scene to follow the event. The NRC inspectors observed the recovery of the shipping containers, their movement to Westover Air Force Base, and the inspection and preparation of the fuel for further shipment.

Overall, this event proved to be of no radiological significance and actions were taken to minimize the risk to the public. Actions taken by VY appropriately focused required resources to control this event.

5.2 Medical Emergency Response Drill

On December 4, 1991, personnel from VY, Rescue, Incorporated of Brattleboro, VT, and Franklin Medical Center (FMC) of Greenfield, MA participated in a medical emergency response drill. This annual drill, to demonstrate the readiness of transportation activities and FMC personnel to effectively treat a contaminated injured person, was evaluated by the Federal Emergency Management Agency and VY.

6.0 SECURITY (71707)

6.1 Observations of Physical Security

Compliance with the security program was verified on a periodic basis, including the adequacy of staffing, entry control, alarm stations, and physical boundaries.

6.2 Activation of Gatehouse 2

On December 19, 1991, Gatehouse 2 access control features were fully activated and operational to support access to and egress from the Protected Area (PA). The modifications to the gatehouse were documented as a laudable initiative in NRC Inspection Report 91-28.

The inspectors performed frequent observations of the access controls and processes implemented to prevent the unauthorized or undetected entry of personnel or contraband into the PA. This included the assessment of security officer, supervisor, and detection equipment performance during high and low volume gatehouse use. The inspectors also monitored the shift of PA access from Gatehouse 3 to Gatehouse 2 and the subsequent closure of Gatehouse 3. In addition, prior to Gatehouse 2 activation, the inspectors discussed security procedures, equipment enhancements, and security positions with the Technical Services Superintendent. These candid discussions and walk-through of Gatehouse 2 assured and demonstrated that VY was fully prepared to open this gatehouse.

Overall, the activation of Gatehouse 2 was well controlled. Senior VY management and senior security supervisors provided a good level of oversight and involvement prior to and during gatehouse activation. Detailed and timely memorandums were distributed to plant personnel and the security staff that identified responsibilities, requirements, and a schedule to support the activities required to shift gatehouses. In addition, specific information was distributed regarding visitor requirements and their access through the gatehouse. There were no security vulnerabilities to VY access controls during this transition.

7.0 ENGINEERING AND TECHNICAL SUPPORT (71707)

7.1 Fuel Failure Indications

The inspector reviewed VY's activities related to failed fuel in light of increased turbine building noble gas activity levels. While radiological exposure levels have remained less than .1 percent maximum permissible concentration (MPC), increased gas activity levels due to failed fuel (both from the current cycle and the previous cycle) have resulted in plant personnel delays at the radiological control point while noble gases decay from clothing. The inspector reviewed the VY "Fuel Performance Monitoring Guidelines and Failed Fuel Action Plan" (FFAP) to verify that selected aspects of the FFAP were being accomplished. Previous VY activities relating to failed fuel were assessed in NRC Inspection Reports 89-10, 90-01, 90-10, and 90-13.

A review of the FFAP indicated that VY's activities in response to failed fuel were based upon six action levels which were tied to steam jet air ejector (SJAE) off-gas activity. The FFAP established a graded approach to SJAE activity levels, with each successive action level resulting in additional required actions. The inspector found that individual departmental activities were well defined by the FFAP and that methodologies employed to perform required actions were described with references identified as appropriate.

Vermont Yankee has been in Action Level IV since September 27, 1991 with SJAE off-gas activity levels between 10,000 and 60,000 μCi/sec. During this inspection period off-gas levels have varied between 50,000 and 60,000 μCi/sec. This figure is an instantaneous value and is indicative of activity due to current fuel pin failure and fuel materials which remain in the reactor vessel following a fuel pin failure during the prior fuel cycle. During the prior fuel cycle, a pin failure resulted in the loss of approximately 4 inches of fuel, which is believed to have plated out on core and reactor vessel components (see NRC Inspection Report 90-10). This material results in increased off-gas activity, referred to as "recoil" activity, which is not indicative of current fuel pin integrity. Based upon initial core XV (current cycle) SJAE activity, VY assumes recoil activity to contribute approximately 23,000 μCi/sec to the total SJAE off-gas activity level. VY has chosen to use gross SJAE off-gas activity values in determining which FFAP action level to enter, while quantitative estimates of failed fuel involve the subtraction of recoil activity. The inspector concluded that this is a conservative approach, in that specific FFAP activities are performed at a lower level of failed fuel than was originally envisioned by the FFAP. The inspector noted that SJAE activity levels when compared to the

TS 3.8.K.1 limit of 160,000 μCi/sec, which include a 30 minute delay time, have ranged from 14,700 to 15,900 μCi/sec equating to instantaneous values of 49,000 and 54,600 μCi/sec respectively, indicating that the plant is well below license limits.

The inspector reviewed selected VY activities with regard to FFAP requirements to verify that predetermined activities were being performed. The reactor and computer engineering (R&CE) department has prepared and issued biweekly reports of fuel failure status consistent with the FFAP. Reports have included recent developments within the report periods, estimations of the number of failed fuel pins (currently believed to be one or two), bases for the estimations, trends in the assumed failures, estimations of failed fuel pin location, recommendations for compensatory rod patterns, assessments of the effectiveness of these control rod strategies, and summaries of quantitative information available to the staff in its evaluations. The inspector found that these reports enjoy a wide distribution to various on-site departments, YNSD, and senior plant management. The inspector also reviewed VY chemistry department actions and found that off-gas isotopic concentrations were being trended to establish both the character and severity of the fuel failure. Additionally, augmented sampling has been performed, consistent with the FFAP and plant procedures. Chemistry and R&CE analyses indicate that the fuel failure is in a third cycle fuel assembly and have mapped out probable locations of the failure.

Operations department actions were reviewed and the inspector found that FFAP requirements were adequately communicated from management to operators. A review of control room night orders indicated that plan requirements for maneuvering rates, rod pattern strategies and general direction to reference the FFAP were properly addressed. The inspector verified that FFAP requirements for the operations department to work with the maintenance department to locate and repair steam leaks were being met, as steam leaks have contributed to higher than desirable noble gas activity levels in the turbine building. A review of the VY stop work list (a summary of work required should the plant shutdown) indicated that steam leaks had been identified in the packing of main steam line drain isolation valve (MS-77), in cover gaskets of the No. 1 and No. 4 turbine stop valves, and in the No. 2 control valve bonnet gasket. Steam leaking from the stop and control valves has resulted in condensate collecting above the main feed pump rooms. The inspector verified that catch containments were installed and that the leakage was directed to appropriate containers (drums).

As a result of failed fuel and steam leaks, turbine building noble gas activity levels resulted in delaying personnel egress from the Radiation Protection (RP) control point. Gases entrained in clothing frequently resulted in alarms at the portal monitors. The inspector noted that a fan had been placed at the RP control point and that personnel were using the fan to increase the rate of diffusion of gases. The inspector questioned this practice with RP personnel, as portal alarms do not discern between noble gas entrainment and particulate contamination. RP personnel agreed that use of the fan could result in spreading contamination and the fan was removed. The inspector verified that daily and weekly checks for contamination in and around the control point had been satisfactorily performed.

In summary, the inspector concluded that VY has a thorough FFAP, that required actions and responsibilities are clearly delineated, and that activities required by the plan are being performed. Additionally, VY's actions in response to activity levels have been conservative and results of analyses are provided to appropriate levels of management.

7.2 Unanalyzed Loads on Safety Class Piping

On approximately December 3, 1991, VY became aware that two work platforms were installed as unanalyzed loads on safety class piping. The platforms were temporarily attached to liquid radioactive waste (LRW) piping near LRW containment isolation valves and a torus to drywell vacuum breaker pipe.

A subsequent analysis on December 3, 1991 by VY and YNSD determined that the loads would have no effect on the operability of the systems. This evaluation did not analyze seismic response; however, an engineering review did determine that the system would not be adversely impacted. In addition, VY decided that if the staging was not removed by December 4, 1991, a Basis For Maintaining Operability (BMO) determination would be needed. At approximately 5:00 p.m. on December 3, 1991, VY made an information call on the Emergency Notification System to the NRC Operations Center regarding these unanalyzed loads on safety class piping. At approximately 6:00 p.m., the staging was removed, thereby removing any question regarding the operability of these systems.

The inspector reviewed this event and concluded that VY had reasonable expectation that the safety systems involved were operable. VY conservatively resolved this condition by the timely removal of the staging. Appropriate corrective actions to determine why this condition was not discovered earlier and to prevent recurrence have been initiated. This condition had existed a number of years.

8.0 SAFETY ASSESSMENT AND QUALITY VERIFICATION (90712, 90713)

The resident inspectors attended a PORC meeting on December 19, 1991, which focused on activities involving the on-line repair of a steam leak. Section 4.2.2 describes the commendable safety perspective exhibited at this PORC meeting.

8.1 Licensee Event Reports

The inspector reviewed the LER 91-07, Supplement 1, "HPCI Inoperable Due To Flow Controller Set Point Drift," submitted to further explain VY's actions with regard to corrective action and root cause determination. The inspector concluded that, with respect to the general aspects of the event: (1) the report was submitted in a timely manner, (2) the description of the event was accurate, (3) a root cause analysis was initiated, (4) safety implications were considered, and (5) corrective actions implemented or planned were sufficient to preclude recurrence of a similar event.

The information was accurate and adequately described the event; however, the "Report Date" block of the LER did not coincide with the LER transmittal date. This type of error has been previously identified in NRC Inspection Report 91-24. VY corrective actions as a result of the first error are still considered adequate. LER 91-07 was initially reviewed in Inspection Report 91-11.

8.2 Periodic and Special Reports

The plant submitted the following periodic and special reports which were reviewed for accuracy and the adequacy of the evaluation:

- Monthly Statistical Report for November 1991.

- Monthly Status of Feedwater Nozzle Temperature Monitoring for October and November 1991.

No discrepancies were identified.

9.0 MANAGEMENT MEETINGS (30702)

9.1 Preliminary Inspection Findings

At periodic intervals during this inspection, meetings were held with senior plant management to discuss preliminary inspection findings. A summary of findings for the report period was also discussed at the conclusion of the inspection and prior to report issuance. No proprietary information was identified as being included in the report.

An unresolved item is a matter about which more information is required to ascertain whether it is an acceptable item, a deviation or a violation. One unresolved item is discussed in Section 4.4.2.

9.2 Region Based Inspection Findings

There were no Region based inspections conducted during this inspection period.

9.3 Significant Meetings

- On December 16, 1991, a meeting was held at the NRC Region I office (NRC:RI) with VY representatives to discuss current plant performance. Topics included recent events and programmatic improvements in the areas of operations, security, radiological controls, motor operated valves, and engineering and technical support. A list of meeting attendees and hard copies of overhead slides used in the VY presentation are contained in Attachments A and B to this inspection report.

-- On December 16, 1991, an Enforcement Conference was held at NRC:RI with VY representatives concerning the performance of plant modifications without conducting a written safety evaluation, which was the subject of AIT inspection follow-up report No. 91-21 issued on December 3, 1991.

ATTACHMENT A

LIST OF ATTENDEES

REGIONAL MANAGEMENT MEETING, DECEMBER 16, 1991

NRC Attendees

W. Kane, Deputy Regional Administrator
J. Wiggins, Deputy Director, Division of Reactor Projects (DRP)
J. Linville, Chief, Projects Branch (PB) 3, DRP
J. Rogge, Chief, Reactor Projects Section 3A
H. Eichenholz, Senior Resident Inspector, Vermont Yankee
D. Lew, Project Engineer, PB3, DRP
W. Lanning, Deputy Director, Division of Reactor Safety (DRS)
L. Bettenhausen, Chief, Operations Branch (OB), DRS
R. Conte, Chief, BWR Section, OB, DRS
T. Walker, Senior Operations Engineer, DRS
S. Hansell, Operations Engineer, DRS
R. Keimig, Chief, Safeguards Section, Division of Reactor Safety and Safeguards
W. Butler, Director, Project Directorate (PD) I-3, Office of Nuclear Reactor Regulation (NRR)
P. Sears, Project Manager, PD I-3, NRR
R. Dube, Safeguards Branch, Division of Reactor Inspection and Safeguards, (DRIS), NRR
M. Warren, DRIS, NRR

Licensee Attendees

J. Weigand, President and Chief Executive Officer
W. Murphy, Senior Vice President, Operations
J. Pelletier, Vice President, Engineering
D. Reid, Plant Manager
R. Wanczyk, Operations Superintendent
R. Pagodin, Technical Services Superintendent

Other Attendees

W. Sherman, State Nuclear Engineer, State of Vermont

ATTACHMENT B

VERMONT YANKEE PRESENTATION SLIDES

DECEMBER 16, 1991

VERMONT YANKEE
STATUS MEETING

December 16, 1991

▪ INTRODUCTIONS/OPENING REMARKS	JGW	(5 min)
▪ SECURITY	RDP	(10 min)
▪ RADIATION PROTECTION	RDP	(10 min)
▪ OPERATIONS	DAR	(10 min)
▪ ENGINEERING/TECHNICAL SUPPORT	JPP	(10 min)
▪ PLANT PERFORMANCE	WPM	(10 min)
▪ SUMMARY	WPM	(5 min)
▪ QUESTIONS AND ANSWERS	ALL	

Attendees:

J.G. Weigand	President
W.P. Murphy	Senior Vice President, Operations
J.P. Pelletier	Vice President, Engineering
D.A. Reid	Plant Manager
R.J. Wanczyk	Operations Superintendent
R.D. Pagodin	Technical Services Superintendent

■ PREVIOUS SALP ISSUES

- NEW GATEHOUSE
- CCTV
- IDS
- ACCESS AUTHORIZATION

- **5/12 SECURITY EVENT**
  - ORGANIZATION
  - COMMUNICATIONS
  - STAFFING/OVERTIME
  - TRAINING EFFECTIVENESS

- **OSRE**
  - RESPONSE PLANNING AND STRATEGY
  - POSITIONING OF RESPONDERS
  - RESPONSE WEAPONS
  - TRAINING ISSUES

- **ONGOING ISSUES**
  - SUPERVISORY CAPABILITIES
  - COMMUNICATIONS/OVERSIGHT
  - SECURITY EFFECTIVENESS

- **PREVIOUS SALP ISSUES**
  - **EFFECTIVE CORRECTIVE ACTION**
  - **OUTAGE STAFFING LEVELS**
  - **CONTAMINATION CONTROL**

- **RP STAFFING ISSUES**
  - ADDITIONAL TECHNICIAN STAFFING
  - NRRPT CERTIFICATION
  - CONTRACTOR RETENTION
  - SUPERVISORY TOURS

- **CONTAMINATION CONTROL**
  - RESIN DEWATERING SYSTEM
  - CONTAMINATION EVENT REPORTING
  - AREA DECONTAMINATION
  - FLOOR PAINTING
  - CONTAMINATED AREA SETUP

- **RADWASTE PROGRAM**
  - **< 4700 CUBIC FEET RADWASTE**
  - **ON-SITE LLW STORAGE**
  - **FUEL POOL CLEANUP**
  - **MIXED HAZARDOUS WASTE**

- **1992 EFFORTS**

  - RP ACCESS CONTROL
  - INSTRUMENT CONTROL PROGRAM
  - LAUNDRY, TRASH, DECONTAMINATION
  - REVISED RWP
  - IMPLEMENT PART 20 CHANGES

- **ONGOING ISSUES**
  - WORKER RP PRACTICES
  - RADIOACTIVE MATERIAL CONTROL
  - RP TRAINING IMPROVEMENTS

OPERATIONS

- **PREVIOUS SALP ISSUES**

- **LOR**
  - BACKGROUND
  - CURRENT STATUS
  - INITIATIVES

- **FUTURE**

PLANT PERFORMANCE

- 1991 EVENTS/ISSUES
- 1991 SUCCESSES
- 1992 PLANS

1991 EVENTS/ISSUES

- PLANT TRIPS
  - MARCH 13 FUEL LOAD REJECT
  - APRIL 23 LOSS OF OFF-SITE POWER
  - JUNE 15 LIGHTING STRIKE - FLR
- FAILED FUEL
- LOW LEVEL RADIOACTIVE WASTE
- SECURITY EVENT
- LICENSED OPERATOR REQUALIFICATION
- DRYWELL PEDESTAL LEAKAGE - SEPTEMBER
- LCO MAINTENANCE
- INDUSTRIAL SAFETY
- EMERGENCY PLAN EXERCISE

1991 SUCCESSES

- EMERGENCY RESPONSE FACILITY INFORMATION SYSTEM (ERFIS)
- MAINTENANCE PLANNING AND CONTROL SYSTEM (MPAC)
- LOW LEVEL RADIOACTIVE WASTE
- EMERGENCY RESPONSE DATA SYSTEM
- CONSTRUCTION PERIOD RECAPTURE LICENSE AMENDMENT
- NEW NPDES DISCHARGE PERMIT
- LICENSE AMENDMENT FOR STORAGE OF SPENT FUEL
- NEW GATEHOUSE
- EMERGENCY PLAN EXERCISE
- PLANT CAPACITY FACTOR OF 93%
- INDUSTRIAL SAFETY
- SIMULATOR CERTIFICATION
- COMPUTERIZED ENGINEERING DATA BASE
- FORMAL GUIDELINES
  - Corrective Action Plan
  - LCO Maintenance Guideline
  - Housekeeping
  - BMO

1992 PLANS

- REFUEL OUTAGE - MARCH
  - Identify/Replace Failed Fuel
  - Install New Main Transformer
  - Replace Two Feedwater Heaters
  - Replace Turbine Steam Piping
  - Install New Drywell Cooling System
  - MOV Maintenance
- NEW FUEL POOL COOLING SYSTEM
- TORUS VENT
- PURCHASE LP TURBINE CASING
- PURCHASE AND INSTALL NEW DECONTAMINATION FACILITY
- UPGRADE POWER LINE FROM HYDRO STATION
- INSTALL NEW TURBINE VIBRATION TRIP SYSTEM
- IMPROVE SECURITY MONITORING SYSTEM
- PREPARE REVISED 10CFR20
- IMPLEMENT ACCESS AUTHORIZATION PROGRAM
- STABILITY ANALYSIS
- ELECTRICAL DISTRIBUTION SYSTEM FUNCTIONAL INSPECTION
- NEW STATION AIR COMPRESSORS
- TRAINING
- MAINTENANCE