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Report No. 94-01

Docket No. 50-271

Licensee No. DPR-28

Licensee: Vermont Yankee Nuclear Power Corporation
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Ferry Road
Brattleboro, VT 05301

Facility: Vermont Yankee Nuclear Power Station
Vernon, Vermont

Inspection Period: January 16 - February 26, 1994

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Approved by: _____ 3/24/94
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Reactor Projects Section 3A

Scope: Station activities inspected by the resident staff this period included Operations, Maintenance, Engineering, Plant Support, and Safety Assessment and Quality Verification. An initiative selected for inspection involved design of the new station air compressors. Backshift and "deep" backshift including weekend activities amounting to 15 hours were performed on January 18 and 20, February 6, 9, 24 and 15. Interviews and discussions were conducted with members of Vermont Yankee management and staff as necessary to support this inspection.

Findings: An overall assessment of performance during this period is summarized in the Executive Summary.

EXECUTIVE SUMMARY

Vermont Yankee Inspection Report 94-01

Operations

Reactor and Computer Engineering oversight of control rod manipulations assured safe reactor core flux distributions and margins to core thermal limits. Cold weather preparations were adequate.

Maintenance

The temporary repair of a non-safety system steam pipe using an industrial leak sealing method was well-controlled. The reconnection of an electrical lead in the main generator protection circuitry was performed with good regard for personnel and equipment safety. Good planning and management involvement occurred during maintenance performed on reactor protection system relays. A seismic qualification issue identified by the NRC was promptly dispositioned. Maintenance program revisions were implemented to address planning and surveillance testing concerns. Inconsistent criteria for inservice testing of containment vacuum breakers led to conservative acceptance criteria.

Engineering

A design change to the non-safety related station air compressors has increased reliability of containment isolation valves and other safety equipment which relies upon instrument air.

Plant Support

Despite cold weather preparations, ventilation and fire systems were challenged by extreme cold temperatures, resulting in fire pump reliability problems. An unresolved item was identified concerning design configuration control of HVAC systems supporting the fire pumps. Caring and competent medical attention was provided to an injured worker by the Medical Response Team. Maintenance on security equipment and mitigation of increasing reactor conductivity levels were effective. Fire brigade response to a water suppression system actuation was timely; program weaknesses were self-identified and were the subject of corrective actions. Housekeeping in the service water intake structure and emergency diesel generator rooms remained good.

Safety Assessment and Quality Verification

Appropriate management reviews were conducted, corrective actions were identified, and reported information in licensee event reports was accurate.

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Note: Procedures from NRC Inspection Manual Chapter 2515, "Operating Reactor Inspection Program" which were used as inspection guidance are parenthetically listed for each applicable report section.

DETAILS

1.0 SUMMARY OF FACILITY ACTIVITIES

Vermont Yankee Nuclear Power Station was operated at power in a safe manner. During this inspection period, reactor power was routinely reduced for planned rod pattern exchanges and surveillance testing. On February 9 reactor power was reduced to approximately 25 percent to allow for maintenance that reconnected a lead on the main generator ground fault neutralizing transformer (Section 3.1.2). The transition to low power and subsequent power ascension were performed well.

2.0 OPERATIONS (71707, 71714, 92700)

2.1 Operational Safety Verification

Daily, the inspectors verified adequate staffing, adherence to procedures and Technical Specification (TS) limiting conditions for operation (LCO), operability of protective systems, status of control room annunciators, and availability of emergency core cooling systems. Plant tours confirmed that control panel indications accurately represented safety system line-ups. Safety tagouts properly isolated equipment for maintenance.

2.2 Reactor Engineering Oversight During Power Operations

Reactor & Computer Engineering (R&CE) oversight of control rod manipulations and thermal power limits contributed to safe plant operations. During the reactor power reduction and ascension performed to establish plant conditions for maintenance (Section 3.1.2), the R&CE engineers were observed evaluating flux distributions by using the prediction mode of the 3D Monicore reactor physics computer program. Control rod movements and deviations from the rod withdrawal schedule were accurately communicated to the reactor operator performing the moves. Routinely, the R&CE engineers briefed the Shift Supervisor regarding the status of xenon reactivity, reactor performance, and the estimated full power rod pattern. The inspector independently verified the rod sequence, core power distribution, and thermal limits for several rod movements; no deficiencies were noted.

The inspector reviewed the procedures used by R&CE for the conduct of control rod movement to support reactor operation and discussed observations with the R&CE Manager. Most notably, the inspector observed that Vermont Yankee (VY) used a computer software program (MAGIC) which had neither been verified nor validated. This program was used by VY to check the rod sequence information generated by Yankee Nuclear Services Division (YNSD). A similar concern was previously identified by a YNSD audit (VY-93-12, December 1993) and a subsequent YNSD surveillance (VY-94-03, January 1994). Disposition of these findings by R&CE are pending. The R&CE Manager stated that preliminary corrective actions are focused on enhancing the quality control measures for verifying and checking the generation of the rod sequence information supplied by YNSD. The R&CE Manager expects that interim actions will be completed prior to the May 1994 rod pattern exchange.

The inspector concluded enhanced control of rod sequence information would minimize the possibility of personnel errors associated with transcription of rod sequence information. The MAGIC program is used as a second check of the quality-controlled information provided by YNSD. Although MAGIC was neither verified nor validated, its use had minimal significance because: (1) defense-in-depth was provided by the use of the rod worth minimizer during this power maneuver; (2) R&CE engineering oversight was continuous; and, (3) this sequence utilized rods of low reactivity worth and reactor power was above 20 percent minimizing concerns involving a rod drop accident. A review of the sequence information by the inspector identified no errors. The independent assessments by the Quality Services Group contained good detail.

2.3 Electrical Grid Stability

Throughout this inspection period, VY monitored electrical grid stability in response to sustained severe cold weather and degraded conditions on the electrical distribution network serving the Pennsylvania, New Jersey, and Maryland (PJM) area. New England Power Exchange (NEPEX), which maintained grid stability this period, monitored electrical power fluctuations in the PJM area due to the potential for their operations adversely affecting the operation of the NEPEX network. Regional electrical networks are inter-connected to maintain overall grid stability. During January 1994, NEPEX supplied power to PJM, in part, due to the PJM increased regional electrical load caused by the severe weather conditions.

Vermont Yankee plant and corporate management were knowledgeable of the situation on the PJM network, the conditions on the NEPEX power exchange, and provided appropriate direction to department managers regarding the conduct of maintenance and surveillance.

2.4 Cold Weather Preparations

The inspectors verified that VY prepared for cold weather conditions by implementing plant procedure OP 2196, Rev. 6, "Preparations for Cold Weather Operations." This procedure establishes plant conditions necessary to mitigate the effects of cold weather on plant operation. Actions performed included surveillance of freeze protection circuitry for piping exposed to the environment, changes in ventilation system lineups to increase area temperatures, and draining of dead leg piping in the cooling tower and spray ponds. Service water discharge was diverted to the cooling tower basin to prevent freezing and the air agitators in the SW intake structure were verified operational. Freeze protection for radiation monitoring and meteorological instruments were also placed in service.

Despite these actions, VY experienced equipment problems due to the extreme cold weather conditions. Sustained temperatures below freezing in January 1994 adversely affected the operation of ventilation system dampers, the switchyard breaker air system, and the diesel fire pump (Section 5.5.1). Vermont Yankee found that extreme cold conditions exacerbated the reduced heating capacity of the steam heating coils within the ventilation system. This caused multiple trips of the reactor building ventilation system and subsequent operation of the standby

gas treatment system. Additional heat tracing and insulation were also applied to the air supply lines that actuate the ventilation dampers. Steam traps have been repaired to improve heating system performance and replacement heating coils have been ordered. In regards to the switchyard breaker air system, the cold weather caused excessive leakage from air flasks used to operate switchyard breakers. Vermont Yankee determined that the air leaks from pipe fittings occur only during extreme cold weather due to piping contraction. Excessive run time on the switchyard air compressor resulted in compressor trips that are alarmed in the control room. No switchyard breaker trips occurred due to the cold weather.

In response to NRC concerns (EDSFI item 92-81-10) regarding gelling of diesel fuel oil during extreme cold weather, VY continued periodic temperature monitoring of the fuel oil system. Instructions were provided to plant operators regarding the gathering of temperature information and a senior engineer was assigned to evaluate the data. An initial assessment confirmed that fuel oil gelling, within the fuel oil storage tank, was not a concern because oil temperatures were approximately 17 degrees above the temperature required for gelling (0 degrees). The storage tank is not heated nor insulated and is exposed to the environment. The fuel oil supply lines are insulated and heated.

The inspectors concluded that VY has implemented an adequate program to prevent equipment problems caused by cold weather. The problems that occurred this period were caused, in part, by sustained temperatures well below freezing. Management attention was appropriately focused on the correction of the equipment problems and actions to preclude recurrence.

3.0 MAINTENANCE (62703)

3.1 Maintenance

The inspectors observed selected maintenance on safety-related equipment to determine whether these activities were effectively conducted in accordance with VY TS, and administrative controls (Procedure AP-0021 and AP-4000) using approved procedures, safe tagout practices and appropriate industry codes and standards. Interviews were conducted with the cognizant engineers and maintenance personnel and vendor equipment manuals were reviewed.

3.1.1 Temporary Pipe Repair in the Advanced Offgas System

On February 1, during a scheduled entry into the advanced offgas (AOG) system drain pit to repair a degraded sump level probe, VY personnel identified a small steam leak on a common drain line for the "A" and "B" hydrogen recombiners. The steam was not a significant personnel safety hazard; however, there was an electrical safety and housekeeping concern because the radioactive steam was condensing on electrical equipment. The function of the AOG system is to reduce the radioactive gaseous release rates to the atmosphere to as low as reasonably achievable levels by filtration and delay. The radioactive gases are generated by normal reactor operation, purged from the main condenser into the AOG system, and discharged to the plant stack.

The leak was located near a tee connecting the two recombiner drains to the common drain line, and was in the heat-affected area of a weld. The piping is non-safety, designed to B31.1, and contained 2 - 5 psig of steam pressure. The leak could not be isolated from the hydrogen recombiners (which are required to be in operation at power), and was caused by weld porosity. Vermont Yankee determined that the leak would be temporarily repaired at power using an industrial leak sealing method.

A comprehensive review was conducted to justify the use of the industrial leak sealing method and the performance of this maintenance at power. The licensee considered and reviewed industry experiences gained from this type of repair, compared safety issues of performing an at-power repair to one conducted while shutdown, and implemented requirements to assure appropriate engineering review and management oversight. The temporary modification process was implemented for the repair, and a safety evaluation concluded that the repair method did not represent an unreviewed safety question. The temporary repair was acceptable for system pressure and temperature requirements and did not alter design considerations such as seismic qualification, chemical compatibility, and structural integrity. Yankee Nuclear Services Division quality assurance (QA) verified the adequacy of the leak sealing vendor's QA program and an onsite audit of the repair process was conducted at the request of the Vice President, Operations; no deficiencies were identified. Design control, documentation, material compatibility, and radiological considerations were discussed at the Plant Operations Review Committee (PORC). The VY radiological assessment and engineering evaluation were discussed with NRC Region I (NRC:RI) specialist inspectors. Good management oversight in this repair activity was observed.

3.1.2 Maintenance on Balance of Plant Electrical Equipment

On February 9, reactor power was reduced to separate the main generator from the grid in order to establish conditions for the reconnection of an electrical lead to a transformer in the main generator protection circuitry. As described in the Final Safety Analysis Report (FSAR), the lead is part of the ground fault neutralizer transformer circuit which limits the ground fault current to a very low value minimizing equipment damage. In the event of a ground fault, indicative of insulation breakdown, ground current will increase and a subsequent turbine trip will occur at a predetermined level. The lead was lifted during turbine generator preventive maintenance conducted during refueling maintenance outage (RFO) XVII and was identified on February 8 during a routine transformer inspection required because of use of PCBs.

Vermont Yankee demonstrated an appropriate regard for personnel and plant safety in their decision to immediately reduce reactor power to connect the electrical lead. A Plant Manager meeting was held to review the repair and coordinate the shutdown. Weather and electrical stability of the offsite electrical distribution network were assessed. Personnel barriers were erected to cordon off areas that potentially represented an electrical safety hazard. Vermont Yankee identified that the lifted lead was contrary to the FSAR functional description described above, thereby requiring corrective maintenance or a 10 CFR 50.59 safety evaluation. The inspectors confirmed that main turbine protection features are balance of plant components and

not required by TSs. Although turbine trips are not safety related, they are described in the FSAR. Long-term corrective actions were in development as of the end of this inspection period.

3.1.3 Reactor Protection System Relay Replacement

Troubleshooting and maintenance to identify and correct an intermittent failure associated with the resetting of the reactor protection system (RPS) occurred with good planning and management involvement. The intermittent condition was identified during periodic surveillance of the "A1" RPS subsystem when operators experienced difficulty resetting a surveillance induced half scram condition. Daily at the Plant Managers meeting, the status of troubleshooting was discussed. Management ensured that this activity was well coordinated and planned because this maintenance required the generation of a half scram condition which increases the risk of a spurious reactor scram. Initial troubleshooting confirmed that the problem was associated with an auxiliary contact on relay 5A-K13A; one of 12 relays that removes power to the control rod scram solenoid valves on a scram condition. The auxiliary contact is used for annunciation, computer interface, and for back-up scram. Failure to reset was not an operability concern with the RPS system.

Vermont Yankee has preliminarily determined that the failure to reset was caused by binding of an auxiliary contact that is actuated by the main contact solenoid. The binding was apparently caused by a bake-a-lite material residue produced by wear of the auxiliary contact slide assembly. A field inspection conducted by the inspector verified a worn auxiliary contact slide assembly, corroborating the apparent root cause determination. The auxiliary contacts were original plant equipment. A search of industry information identified no specified service life for the auxiliary contact. The cognizant VY engineer stated that the K13 relay solenoids were replaced approximately three years ago in response to General Electric (GE) concerns regarding age-related solenoid failure (GE SIL No. 508, Scram Contactor Coil Life and Maintenance). The inspector performed a field inspection of all scram relays for solenoid discoloration indicative of overheating and insulation breakdown; no discrepancies were observed. Vermont Yankee plans to inspect the other K13 RPS relays and assess whether this failure was of an isolated nature.

3.1.4 Maintenance Program Improvements

During this inspection period, VY revised their LCO Maintenance Guideline to improve the management and control of maintenance. The improvements resulted from corrective actions initiated to resolve problems identified during service water preventive maintenance, and during standby liquid control troubleshooting and testing. Further, the program was strengthened by lowering the system unavailability threshold which, if exceeded, initiates higher levels of management review for maintenance performed within a LCO time period.

Service Water Pump Maintenance

The first program change was implemented to address concerns involving the planning of LCO maintenance. On January 18, during a field inspection of maintenance conducted on the "C" service water (SW) pump, the inspector questioned whether the seismic analysis for the SW system supported the removal of the "C" SW pump from its associated piping and pedestal. The pump removal was necessary for preventive maintenance (PM). With the pump removed, a seismic anchor point was potentially invalidated and the as-left piping was potentially over stressed, because it was left unsupported. These conditions represented a potential safety issue, because the over stress condition existed in a portion of SW piping cross-connecting both SW sub-systems. The appropriate 24-hour LCO action statement was entered based on an initial analysis by VY. A more rigorous seismic analysis and efforts to reinstall the pump pedestal were then initiated. Within two hours the pump pedestal was installed restoring the as-built condition and the 24-hour LCO was exited. Shortly thereafter, a second and more rigorous seismic analysis concluded that seismically-generated stresses were within code allowable and that the SW system was operable even with the pump removed. This analysis was documented in VY's Basis to Maintain Operability (BMO) 94-01.

Corrective actions were initiated to assure that maintenance does not place safety systems in configurations potentially outside their design. Detailed descriptions of equipment removal activities and the temporary measures to assure that adequate design margins are maintained are now required during PM pre-planning. These requirements will be performed by the Engineering Department during their review of the LCO maintenance package. The Plant Manager placed a hold on all LCO maintenance pending approval of this change to the LCO Maintenance Guideline. The actions taken by VY to evaluate and resolve the seismic qualification of the system condition were timely. Appropriate notifications and management reviews were performed, a well-planned strategy was implemented to restore the SW system, and a significant corrective action report was initiated.

Standby Liquid Control Surveillance

On February 1, VY determined that inadequate instructions existed to control the conduct of troubleshooting that was occurring following surveillance testing. This concern was identified during the daily Plant Manager Meeting when the Operations Manager reported that the discharge isolation valve for the non-operating standby liquid control (SLC) pump would be shut immediately following the quarterly pump capacity test (with the tested pump operating). This action would verify the seating capability of the pump discharge check valve when pump capacities are compared. Lower than normal pump flows were previously identified during inservice testing and the recommendation to shut the discharge check valve during surveillance was documented in Corrective Action Report (CAR) 93-57.

Plant surveillance OP 4114, Rev. 26, "Standby Liquid Control System Surveillance" shuts the SLC injection valves and opens the test tank isolation valves to recirculate borated water between the test tank and SLC pump; the SLC pump discharge isolation valves remain open. Therefore,

manual valve manipulation is required for the SLC system to perform its safety function while conducting surveillance testing. Vermont Yankee does not enter the SLC TS LCO action statement during surveillance, and instead credits manual action by operators for maintaining system operability.

In this case, the conduct of troubleshooting during a surveillance activity did not represent a safety concern. Technical Specifications requires periodic pump capacity testing. The Auxiliary Operator performing the valve manipulations was knowledgeable of required actions to restore system operability, the surveillance was conducted in accordance with the procedure lineup, and a pre-approved work plan was implemented to cycle the discharge isolation valves. However, VY identified that improved control of troubleshooting while conducting a surveillance procedure was necessary because: (1) valve manipulations required by work orders do not receive equivalent management reviews as do valve lineup deviations or procedure changes; and, (2) troubleshooting during surveillance testing potentially changes the intent of the surveillance procedure which would require an assessment by the Plant Operations Review Committee (PORC).

Good management involvement and direction was observed during the daily meeting when the intention to conduct the activity was brought to plant management's attention. Unfortunately troubleshooting was already in progress at the time of the Plant Manager's meeting. The Plant Manager initiated a hold on all activities that combine surveillance and troubleshooting pending completion of corrective actions.

3.2 Surveillance (61726)

The inspector reviewed procedures, witnessed testing in-progress, and reviewed completed surveillance record packages. The surveillances which follow were reviewed and were found effective with respect to meeting the safety objectives of the surveillance program. The inspector observed that all tests were performed by qualified and knowledgeable personnel, and in accordance with VY TS, and administrative controls (Procedure AP-4000), using TS approved procedures.

- AP 0164, Rev. 3, "Operations Department Inservice Testing"
- OP 4105, Rev. 4, "Fire Protection Systems Surveillance"
- OP 4114, Rev. 26, "Standby Liquid Control System Surveillance"
- OP 4152, Rev. 22, "Equipment and Floor Drain Sump and Totalizer Surveillance"
- OP 4202, Rev. 13, "Primary Containment Vacuum Breaker Inspection and Testing"

3.2.1 Vacuum Breaker Surveillance Testing

On February 7, VY determined that the force required to operate one of two reactor building to suppression chamber vacuum breaker valves exceeded the inservice test (IST) acceptance criteria. The subject valve (V16-19-12B) was declared inoperable in accordance with the IST Program and the 7-day LCO was entered. The as-found value of 24 pounds (lbf) was above the

IST-determined acceptable range of 4 - 12 lbf. This was the first quarterly test following the determination of IST baseline values in October 1993. The vacuum breakers (V16-19-12A and 12B) are 18-inch diameter, free-swinging, check valves that prevent the suppression chamber from operating at a vacuum with respect to atmospheric pressure. Valve V16-19-12A operated as designed within its acceptable range of 11 - 33 lbf.

Vermont Yankee reviewed the surveillance results and IST Program requirements, and subsequently determined that the valve (V16-19-12B) was operable. This evaluation was conducted pursuant to ASME Code OM-10, Section 4.2.1.9(c) and VY procedure AP 0164, Rev. 3, "Operations Department Inservice Testing." Vermont Yankee also found that the determination of the V16-19-12B acceptance range (4-12 lbf) was in error resulting in an overly conservative reference value. This occurred because the test methodology was inconsistently implemented during baseline determinations in October 1993, due to a lack of complete procedure instructions. Based on interviews with the personnel who conducted the October 1993 and February 1994 tests, VY determined that the test for the subject valve V16-19-12B was unlike the others performed due to a different interpretation of the surveillance requirements by the maintenance crew. A procedure revision was implemented to add additional and clarifying test methodology information. The PORC reviewed the corrective actions contained in CAR 94-08 on February 3.

The inspector concluded that the corrective actions would assure the consistent performance of this particular IST surveillance. The safety significance of this issue was low because valve operating force was consistent with results from other tests, no abnormal trend was identified, and the as-found force was significantly below design operating force ($\leq$ 142 lbf). Further, this was apparently the first case in which the lack of clear procedural instructions had caused inconsistent results for this particular test. The inspectors were concerned that the corrective actions documented in CAR 94-08 were narrowly focused because: (1) a review of other procedures for similarly configured valves was not performed; and, (2) the low acceptance range (4 - 12 lbf) for V16-19-12B was not questioned in October 1993. However based on discussions with the Plant Manager (PM), these issues were addressed though not documented.

4.0 ENGINEERING (71707, 37700)

4.1 Air Compressor Design Review

Due to concerns regarding the adequacy of the air compressor (AC) room ventilation system during cold weather, VY initiated a review of the engineering design change (EDCR 92-406) that installed new air compressors and reconfigured ventilation flow for the new AC room. As discussed in Section 5.5.2 of this report, cold temperatures within this room resulted in a fire suppression sprinkler pipe rupture. The licensee's review identified that design data supplied by the AC vendor may have misrepresented the actual air flow required for AC operation and that this may have contributed to inadequate room heating during cold temperatures. The inspector reviewed the EDCR and verified that ventilation flow requirements for both summer and winter operation were based on this information. Provisions were also established for

extreme cold temperatures based on this information. Currently, the ventilation requirements for the AC room are being re-evaluated and a minor modification to the AC room is being planned.

Despite the need to re-assess room heating, the inspector concluded that the as-built installation of EDCR 92-406 has increased the reliability of the service and instrument air systems which are used, in part, for the operation of primary containment isolation valves. Air compressor control power is now provided by two independent sources verses a common supply originally installed. In addition, because the new compressors are air cooled, service water is no longer required for compressor cooling. This simplifies operator actions during a loss of offsite power and increases service water cooling capacity. Vermont Yankee's actions to address the event were appropriate.

5.0 PLANT SUPPORT (71707)

5.1 Radiological Controls

Inspectors routinely observed and reviewed radiological controls and practices during plant tours. The posting of contaminated, high airborne radiation, radiation and high radiation areas were in accordance with administrative controls (AP-0500 series procedures) and plant instructions. High radiation doors were properly maintained and equipment and personnel were properly surveyed prior to exit from the radiation control area (RCA). Plant workers were observed to be cognizant of posting requirements and maintained good housekeeping.

5.1.1 Spent Resin Tank Overflow

On February 8, the inspector conducted a tour of the radwaste building and observed VY efforts to upgrade radiological and housekeeping conditions in this facility. Significant removal of extraneous material and the resurfacing of floors was occurring. The latter effort would both reduce the amount of surface area contaminated within the plant and ease future clean-up efforts. The inspector noted that the floor in the locked area housing the spent resin tank, although recently decontaminated and prepared for resurfacing, had contaminated resin on the floor. The inspector reviewed the radwaste operator and the radiation protection (RP) checkpoint logs, but found no entries documenting any event causing the condition.

Although not required by current radiological conditions, the area is maintained locked. This is a conservative VY measure, because the resins in the tank originate from a polishing type waste demineralizer which uses an upstream waste collector filter. Historically, spent resins from this system have not caused significant radiological exposure concerns. Nonetheless, entries into the area are performed under the supervision of an RP technician. A survey of the area on February 9 indicated floor contamination levels in the range of 1,000 to 30,000 dpm/100cm square beta-gamma, no detectable alpha contamination, and a general area radiation dose rate of 5 mR/hr. Postings and surveys were determined to be appropriate for the radiological conditions.

The inspector conducted a review of procedural controls associated with this liquid radwaste system and interviewed Auxiliary Operators in an effort to understand the nature and frequency of occurrence of the condition. The inspector learned that the spillover of spent resins on the tank room floor is a longstanding problem, which is caused by both system design limitations and process controls. The inspector concluded that the condition is one that VY personnel had previously chosen to live with, although a number of operator comments involving process improvements were recently incorporated in a soon to be released revision to procedure OP 2151, Liquid Radwaste. Enhancements to the procedure added to prevent overflow require the monitoring of spent resin tank level and establishment of prerequisite available tank volumes necessary to accommodate certain evolutions.

To assure that an adequate basis existed for VY to rely on the tank's level instrumentation, the inspector reviewed preventive maintenance activities for this balance of plant equipment. Other than the level recorder, the inspector found no functional or calibration checks, or preventive program, for the level instrumentation. This condition potentially diminishes the value of the procedural enhancements. Communications of planned evolutions of the liquid radwaste systems between operators and RP technicians was determined by the inspector to be weak, which exacerbates concerns that changing radiological conditions may not be identified and corrected in a timely manner.

The inspector concluded that the overflow of the spent resin tank had caused poor radiological conditions, especially in light of the notable efforts to reduce the amount of area in the plant that is contaminated. The inspector had no further questions on this issue at this time.

5.2 Emergency Preparedness (71707)

5.2.1 Medical Emergency Response

On February 8 a medical emergency was declared in response to a plant worker injured as a result of slipping on snow outside the maintenance shop. The medical response team (MRT) and security personnel quickly responded. The inspector observed caring and competent medical attention being provided to the injured worker. Medical emergency and security procedures were followed. Effective communications occurred between the MRT, security, and the control room personnel. The plant organization responded well to this event, which contributed to the timely evacuation of the injured worker to a nearby hospital.

5.3 Security

The inspector verified that security conditions met regulatory requirements and the VY Physical Security Plan. Physical security was inspected during regular and backshift hours to verify that controls were in accordance with the security plan and approved procedures.

During backshift inspection on February 9, the inspector observed the conduct of security operations in the secondary alarm station (SAS). Accurate communications existed between officers during alarm response and the assessment of security conditions. A SAS station turnover included appropriate information and the officers were attentive to duty. The inspector verified that appropriate priority was established to correct degraded security equipment that has performed unreliably since April 1993. The maintenance record documented communications with the equipment vendor and troubleshooting conducted to identify the intermittent and recurrent problem. Troubleshooting is continuing and a plan was developed to correct the condition. Effective compensatory measures were implemented. No concerns were identified with respect to timeliness of repair or compensatory actions.

5.4 Chemistry

As documented in NRC Inspection Report 93-33, VY monitored reactor conductivity to assure compliance with administrative limits and TS requirements. As a result, an increasing trend was observed and actions were implemented to assess condensate demineralizer performance. This period, filter elements were replaced in one of the five demineralizers to increase the efficiency of the powdex demineralizer system. In addition, a contractor specializing in condensate demineralizer operation was on site to evaluate and recommend improvements in system operation and hardware. A multi-disciplined task team was also formed to evaluate system performance. Plant management disposition of recommendations continues. As a result of the maintenance performed, reactor water conductivity has returned to previously established low values which are significantly below administrative and TS limits.

5.5 Fire Protection

5.5.1 Inoperability of Both Fire Water System Pumps

On February 9 both fire water system pumps were inoperable at the same time for approximately 20 hours due to separate problems. Maintenance personnel investigated and found the diesel fire pump (DFP) in an overcrank condition (a diesel protection feature which causes a diesel shutdown during the start sequence) and a tripped breaker for the electric fire pump. Further, the service water system was cross connected to the fire main for a short period of time to restore fire suppression capability. Both fire water pumps are located in the service water intake structure.

Electric Fire Pump

Troubleshooting identified that the power supply breaker on the electric fire pump (EFP) inadvertently tripped during pump start. A re-start of the EFP was not attempted and the EFP pump was declared inoperable. The breaker trip was not repeatable and a conclusive root cause could not be determined following the completion troubleshooting and subsequent equipment operations. The next day, the EFP was returned to service following a review of the completed work package.

Diesel Driven Fire Pump

Prior to the auto-start failure on February 9, the diesel driven fire pump (DDFP) was considered inoperable (however available) because it demonstrated unreliability when it failed to start on January 20. In January, VY identified that the number of engine cycles required for engine start was greater than the number set by the overcrank engine protection feature. This was thought to be caused by cold engine conditions. The DDFP remained inoperable for 35 days until jacket cooling and lubricating oil heaters were installed to increase the static temperature of the diesel engine. These corrective actions were discussed with the diesel vendor. When the DDFP was originally supplied to VY, the vendor manual did not recommend augmented engine heating as is currently the case. The licensee kept the DDFP in a standby mode to maintain pump availability; in this mode, the auto-start feature was enabled in case of low fire header pressure. The cause for the DDFP inoperability was attributed to an undocumented alteration of the HVAC in the service water pump room. Air intake and exhaust dampers originally provided were subsequently removed. Although supplemental heating was provided, until the engine heaters were installed, the ambient temperature of 50 degrees F necessary to achieve engine starting reliability could not be obtained without the HVAC dampers. Re-installation of HVAC dampers is planned. Design configuration control is considered to be unresolved (URI 94-01-01) and will be reviewed during a future inspection.

Safety Significance

The significance of both fire water pumps being unavailable was compensated by effective fire fighting capability of the Fire Brigade using portable fire extinguishers, plant fire detection equipment remained operable, and the fire main was cross-connected (by procedure) to the service water system. When the DDFP was declared inoperable on January 20, the applicable 7-day LCO was entered. When this LCO was exceeded on January 27, VY commenced preparing a special report to the NRC describing root cause and corrective actions to restore the DDFP to service; this report was submitted on February 23 within the 30-day notification requirement. Reports and notifications required for inoperability of both fire water pumps were also accomplished. Previous concurrent failures had not been experienced, and the fire water pumps generally exhibit good reliability.

5.5.2 Fire Brigade Response

On January 20, the inspectors observed the Fire Brigade response to a fire water system actuation in the air compressor (AC) room. Adequate team work was observed while brigade members donned fire fighting equipment. Material condition of the equipment appeared to be good. The brigade responded within minutes with appropriate fire fighting equipment and conditions in the AC room were stabilized shortly thereafter. Frequent communications occurred between the Fire Brigade Leader (FBL) and the control room using portable and permanent communication equipment. The brigade verified no fire occurred and identified that a fire suppression sprinkler was broken and spraying water onto the floor of the room. The FBL appropriately stationed fire watches to compensate for the isolation of the local fire header supplying the broken sprinkler. The FBL demonstrated knowledge of the fire system design.

Vermont Yankee determined that the sprinkler broke due to water freezing in the dead leg of piping at the sprinkler head. This was confirmed by thermographic assessment of the fire water supply pipe. Room heating was increased to offset the extreme outside cold conditions experienced at this time.

Vermont Yankee subsequently identified that additional management control of the Pre Fire Plans (PFP) was required. The PFP is used by the Fire Brigade Commander and outlines fire fighting strategies, combustible loading, and possible ignition sources. The PFP was uncontrolled such that the accuracy of the information was not verified and was not reviewed to assure that plant design changes were incorporated. The PFP book was also left in disarray following the brigade response on January 20. Actions were initiated to correct these deficiencies. The licensee also initiated a review of the engineering design change (EDCR 92-406) that installed the air compressors and reconfigured the original ventilation flow within the AC room due to concerns regarding inadequate room heating (Section 4.1).

5.6 Housekeeping

During inspection of the SW intake structure (Section 3.1.4) and emergency diesel generator (EDG) rooms, material conditions remained consistent with previous observations. Area lighting, general cleanliness, and integrity of system piping were adequate. Inspection of the SW deep basin identified no significant foreign material that could potentially impact SW pump operation. Service water pump seal leakage and oil deposits in the EDG sump and fuel injector pans continue to diminish the visual cleanliness of these areas. No transient flammable materials were identified, components and piping were free of corrosion, electrical cabinets were clean, and the storage of temporary tools was good. Fire protection tours by VY personnel were observed and discrepancies documented. The conditions observed did not detract from SW and EDG operability.

6.0 SAFETY ASSESSMENT AND QUALITY VERIFICATION (40500, 90713)

6.1 Review of Written Reports

The inspectors reviewed Licensee Event Reports (LERs) submitted to the NRC to verify accuracy, description of cause, and adequacy of corrective action. The inspectors considered the need for further information, possible generic implications, and whether the event warranted further onsite followup. The LERs were also reviewed with respect to the requirements of 10 CFR 50.73 and the guidance provided in NUREG 1022.

- LER 93-10 Failure to Perform Annual Valve Cycling as Required by Plant Technical Specification 4.13.B.1.d for a Valve in the Vital Fire Suppression Water System Flow Path Due to Procedural Omission

The inspector concluded that the licensee investigation was appropriately self-critical and of good detail as exhibited by the root cause (human error) and safety significance determinations. Verification of the listed corrective actions was performed by the inspector and appropriate commitment dates were completed.

- LER 93-12-01 Appendix J Type B and C Failure Due to Seat Leakage

These LERs documented VY root cause and corrective actions for the failure of two primary containment isolation valves to pass leak rate testing conducted during the refueling outage. Containment air check valve (CA-89C) failed due to dirt and corrosion fouling of valve internals. Leakage exceeded 0.7 pounds per hour (lbms/hr) indicating that the disk was not seating. The valve was cleaned and retested. Design Change Request 94-007 is currently in review and will (1) replace air piping with corrosion resistant material, and (2) install in-line air filters to reduce the transportation of foreign material. This type of modification was effective on main steam isolation valves and other safety systems. The second failure occurred with transverse incore probe (TIP) ball valve #2. Root cause was attributed to ball valve lubrication buildup on the seating surface. This was not a recurrent failure, vendor discussions occurred, and VY determined that this was not a generic failure. The safety significance of these failures was low due to minimal volume of containment air that would be potentially released into the reactor building during an accident.

- LER 93-13-01 Safety Related Switchgear Found to Have Less Anchorage Than Required by the Original Plant Design
- LER 93-14-01 Inoperable Alternate Cooling System Due to Inadequate Inspection/Acceptance Criteria

These LERs clarify previously docketed information and described additional evaluations conducted by VY to understand and correct the inadequate seismic mounting of Class 1E switchgear and silting of the cooling tower deep basin, respectively, Inspector review of these issues were documented in NRC Inspection Reports 93-21 and 93-29.

- LER 93-16 Generic Failure Mechanism in RHRSW Pump Motor Cooling Supply Due to Inadequate Original Construction Design Review

This event was reviewed in NRC Inspection Report 93-21.

Periodic and Special Reports

Vermont Yankee submitted the following periodic and special reports which were reviewed for accuracy and found to be acceptable:

- Monthly Statistical Report for January 1994.
- VY Cycle 17 Start-Up Test Report

This report was submitted documenting the completion of reactor and computer engineering (R&CE) activities to verify the satisfactory conduct of reactor core refueling. The data and description of activities were accurate. Independent verification of axial power distributions, thermal limits, and criticality predictions were performed to provide further assurance of safe core operation. Core thermal power levels trended with predictions and instrument uncertainties were within tolerances. Based on a review of the TS reporting requirement the inspector questioned the need for report submission, since no work was conducted during RFO XVII that satisfied the reporting criteria of TS 6.7.A.1. The R&CE Manager stated that the reasons for a report submittal would be reviewed.

- Report of Fuel Failure Status and Parameter Trends for January 1994

This periodic report trends radioactive isotopic concentrations for an assessment of fuel integrity. Currently, based on offgas levels, ratios of radioactive isotopes, and computer analysis of reactor water activity, no fuel defects exist, no abnormal trends exist, and the offgas release rate matches the beginning of cycle prediction.

7.0 MANAGEMENT MEETINGS (30702)

7.1 Preliminary Inspection Findings

Meetings were held periodically with VY management during this inspection to discuss inspection findings. A summary of preliminary findings was also discussed at the conclusion of the inspection in exit meetings held on February 18 and March 4. No proprietary information was identified as being included in this report.