U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No.	95-21
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:	August 22 - October 2, 1995
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Approved by:	Richard J. Conte 10/31/95 Richard J. Conte, Chief Date Projects Branch No. 5
Scope:	Station activities inspected by the resident staff this period included Operations, Maintenance, Engineering, Plant Support, and Safety Assessment and Quality Verification. Back-shift including weekend activities amounting to 14 hours were performed on August 22, 27, 28 and September 6, 11, 14 and 29. Interviews and discussions were conducted with members of Vermont Yankee management and staff to support this inspection.
Findings:	The inadequate implementation of a fire watch stationed to compensate for deficiencies in Vermont Yankee's Appendix R fire protection strategy will be examined further in conjunction with the broader human performance concerns involving the Appendix R/Fire Protection Program issues **(URI 95-21-01)** (see Section 5.4). Licensee corrective actions to resolve an event in which a maintenance worker inappropriately entered a high radiation area remains unresolved **(URI 95-21-02)** (see Section 3.1.2). Additional assessments of performance during this period are summarized in the Executive Summary that follows.

EXECUTIVE SUMMARY

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Safety Assessment and Quality Verification

Vermont Yankee continued to operate safely. This was demonstrated in the control room and during maintenance when abnormal conditions were identified and appropriately resolved. Effective management reviews and quality assessments were evident during routine meetings of the Plant Operations Review Committee. This was most notable in the VY staff's review of Appendix R deficiencies, a reactor level perturbation, service water pinhole leaks, and the incorporation of industry experiences into plant procedures.

Poor work practices by four individuals within the Maintenance Department were of particular concern because these events involving cognitive errors represented a departure from the safe work practices routinely observed.

Operations

Control room operators effectivly evaluated and mitigated a decrease in instrument air pressure as evidenced by good command and control by the shift supervisor of the plant staff's response and a thorough walkdown and examination of the instrument air system by the operators. A planned reactor power reduction to support a rod pattern exchange and surveillance testing was well executed as evidenced by succinct and direct control room operator communications, effective control and monitoring of plant parameters, and good independent verifications during these evolutions. Recent licensed operator re-qualification training dynamic simulator examination failures were reviewed and station management's response to these training deficiencies was considered appropriate. Control room operator response to a reactor vessel level perturbation demonstrated good attention to detail.

Maintenance and Surveillance

The at-power preventive and corrective maintenance of the "A" emergency diesel generator (EDG) was conducted with quality and appropriate supervisory oversight. The effectiveness of this maintenance and its qualitative contribution to plant safety was justified by the identification and resolution of deficiencies and verification of EDG material conditions. A detailed risk-based assessment helped quantify the removal of this safety system from service. VY Work Order trending and backlog management was examined and found to be appropriate, with proper prioritization of outstanding Work Orders on safety systems.

Engineering

The occurrence of pinhole leaks in a straight run, low fluid velocity, seamless service water pipe did not appear to represent the generally historical pipe degradation mechanisms of erosion, microbiologically influenced corrosion (MIC), or general corrosion. The VY staff's sensitivity to this piping concern was evident and the monitoring program implemented,

until repairs can be effected, was viewed as appropriate. VY's assessment of an NRC Information Notice regarding MIC was thorough and focused on the long-term, continuous evaluation of service water pipe integrity.

Plant Support

The entry into a high radiation area without radiation protection (RP) technician coverage during the replacement of a reactor water cleanup pump seal was contrary to procedural requirements. Immediate corrective actions were timely and appropriate. This event alone was of low radiological safety significance, however, further NRC review is necessary to assess the effectiveness of the human performance root cause analysis and associated long-term corrective actions **(URI 95-21-01)**.

Radiation Protection technician performance during changing radiological conditions caused by HPCI and RCIC surveillance testing contributed to reduced personnel radiation exposures. The failure to properly implement a compensatory fire watch for an Appendix R safe shutdown design deficiency will be examined further in conjunction with the broader performance issues involving this Appendix R/Fire Protection Program concern **(URI 95-21-02)**. Good housekeeping was observed in the vicinity of both safety and non-safety related structures, systems and components. One noteworthy housekeeping weakness involved the accumulation of lubricating and fuel oils under the "A" EDG.

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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 (VY) operated at 100 percent rated reactor power for most of this inspection period. On September 11, reactor power was reduced to approximately 70% for a planned rod pattern exchange and surveillance testing. On September 12, a public meeting was held with VY to discuss the results of the NRC's Systematic Assessment of Licensee Performance (SALP) report. On September 13, a routine Emergency Plan exercise was held. This exercise included full State, NRC, and Federal Emergency Management Agency participation.

On September 19, VY announced that Mr. J. Thayer accepted the position of Vice President - Engineering. Mr. Thayer comes from Yankee Atomic Electric Company (YAEC) where he was the Vice President - Operations. Mr. Thayer replaced Mr. J. Pelletier who moved to a position in the YAEC organization.

2.0 OPERATIONS

2.1 Operational Safety Verification

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 for the "A" emergency diesel generator (EDG), "B" hydrogen/oxygen monitor, and two reactor building ventilation fans properly isolated the systems for maintenance. Based, in part, upon the VY Probabilistic Risk Assessment, safety inspections were conducted on the "B" EDG, emergency core cooling systems, the torus area, scram discharge volumes, and control rod hydraulic control units. No conditions adverse to quality or system operability were identified.

2.1.1 Review of Licensed Conditions and Requirements

The inspector reviewed the VY operating license to assess whether licensed conditions and requirements were appropriately incorporated in VY procedures. This review was conducted, in part, because the NRC staff had noted problems at another commercial nuclear facility where a particular licensed condition involving reactor power was not properly implemented. The inspector's review verified that licensed conditions effecting reactor operations were properly captured in station operating procedures.

2.1.2 Licensed Operator Performance and Training Deficiencies

During this inspection period the inspectors were informed by station management of recent licensed operator performance and training deficiencies. In particular, one operator holding a senior reactor operator license and assigned Shift Supervisor (SS) responsibilities was removed from licensed

activities because of performance related deficiencies. This individual had been placed in remediation and was being more closely monitored, however, failed to achieve an acceptable level of performance.

In addition, two operating crews failed dynamic simulator training. The first crew (an on-shift operating crew) successfully completed and passed remediation training. The second crew (a staff crew) did not successfully complete remediation. The staff crew included the Operations Manager, who was temporarily relieved of licensed responsibilities per TS 6.1.D.7 until remediated.

As of the end of the inspection period, all eight (six shift and two staff) crews had completed dynamic simulator examinations this re-qualification training cycle. Coincident with the crew failures, there were seven individual failures (involving four licensed operators from the staff crew and three licensed operators from the one shift crew) due to unsatisfactory execution of critical tasks. The three shift crew individuals successfully completed remediation. The inspectors considered VY management's response to these licensed operator training deficiencies appropriate and the small number of failures not indicative of a training program concern. The inspectors discussed these licensed operator training issues with NRC Region I licensed operator examiners specialists and concluded no additional inspector follow-up was necessary at this time. The inspector notes that the next NRC inspection of licensed operator re-qualification is currently scheduled for April 1996.

2.2 Control Room Administrative Briefings

As described in VY Operations Department Night Order dated September 20, the Operations Manager (OM) approved the conduct of administrative briefings in the control room for all shift crews. The briefings were scheduled to take approximately 15 minutes and be conducted after shift turnover with the on-shift operators "at the controls." The briefings were to be conducted by a consultant to VY hired to review and assess a proposal to change from an 8-hour to a 12-hour shift schedule. Project considerations include, in part, business needs, employee desires, health and safety, and schedule. Vermont Yankee expects the consultant to complete their review by January 1996.

The inspectors re-examined NRC guidance involving the conduct of control room (CR) activities, as described in Regulatory Guide 1.114, Operators at the Controls and Senior Operators in the Control Room; NUREG 0578, which provides generic guidance for the administrative burden placed on shift supervisors; 10 CFR 50.54(m)(2)(iii), which describes operators at the controls; and, 10 CFR 50.55.53(e) and (f), which describe the act of performing the functions of an operator. The inspectors also reviewed VY procedure AP 0151, "Responsibilities and Authorities of Operations Department Personnel." Prior to these control room briefings, the inspector discussed this information and the scope of the briefings with the OM to sensitize him to the potential for distracting operators from their principle functions.

The inspectors observed two of the crew briefings and noted that the control room staffs remained attentive to the plant (control panels) while listening to the briefs. In addition, VY management controls (as described in AP 0151)

established for the conduct of operator training within the CR were appropriately applied during the crew meetings. No deficiencies were noted.

2.3 Rod Pattern Exchange

On September 11, the inspectors observed control room operators (CROs) reduce reactor power, perform surveillance testing, and conduct a planned rod pattern exchange (RPE). The inspectors reviewed the associated operating and surveillance procedures and Operations Department Night Orders in preparation for this activity. Of particular interest was command and control, communications, and the pre-planning associated with the RPE.

The inspector observed safe reactor plant operations. This was demonstrated by effective control of the reactor recirculation system and monitoring of plant parameters during the power maneuvers; conduct of main steam isolation and turbine bypass valve surveillance testing; and, the inter-departmental coordination and support for the rod pattern exchange. The manipulations of reactor controls were deliberate and in accordance with plant operating procedures. Oversight provided by the supervisory CRO contributed to the effectiveness of plant operations and surveillance testing because he second-checked activities implemented by the reactor operators and independently verified the correct implementation of procedural requirements. The SS conducted pre-test crew briefings prior to main steam isolation valve and turbine bypass valve testing describing prerequisites, precautions, and procedural steps. Emphasis was placed on self-checking techniques and the monitoring of reactor plant parameters, such as steam flow, reactor level, and reactor power.

Communications were succinct and direct. Verbatim repeat backs were observed and no miss-communications were noted. Inter-departmental communications were also good, as demonstrated by the discussions with the Radiation Protection (RP) and Chemistry staffs prior to reactor power changes. The SS demonstrated a strong commitment to good crew performance by coordinating CROs in the performance of independent activities. This effort was notable during the rod pattern exchange and main steam isolation valve surveillance testing and contributed to enhanced human factor performance.

The inspector noted that the Operations Department Night Orders accurately described the anticipated sequence of events during the RPE. Instructions of appropriate detail also outlined the coordination of Reactor and Computer Engineering and Instrument and Controls staffs for the performance of neutron instrumentation gain adjustments and control rod manipulations. In accordance with TS requirements, a senior licensed operator approved the instructions to the operating crew. Overall, strong staff performance for these evolutions was demonstrated.

2.4 Instrument Air Pressure Transient

On September 6, the inspector observed operators respond to, assess, and mitigate an unanticipated decrease in instrument air pressure. Control room operators observed that air pressure decreased from a normal pressure of 105 psig to 85 psig in approximately 15 minutes. Plant operating procedures ON

3146, "Low Instrument/Scram Air Header Pressure," and OP 2190, "Service and Instrument Air," were used to mitigate the loss of air pressure. Instrument air header pressure was stabilized following a combination of operator actions. At less than 55 psig, CROs are required by procedure to scram the reactor to prevent improper operation of the control rod drive system, various feedwater and turbine control valves, and the outboard main steam isolation valves.

Based upon observed operator actions and a review of the applicable operating procedures, the inspector concluded that overall operator response to this event was very well done. During the event, operator performance was professional. The SS gave specific instructions to commence a system walkdown to identify leaks and to contact the Maintenance Department regarding any activities that could be affecting the instrument air system. The SS actions established positive control of the operating crews response. Communications were effective, in that, the control room staff understood and remained cognizant of the status of the air system lineup and the response actions being taken or planned.

The inspector verified that industry information (NRC Generic Letter 88-14) regarding instrument air problems was incorporated in VY procedures. Other than the reduced air pressure, no other system problems occurred during this transient. The decrease in instrument air system pressure was attributed to a high differential pressure across the in-service air dryer equipment.

2.5 Feedwater Level Control Anomaly

On September 6, the CROs observed a slight increase in reactor vessel water level from 160 inches to 163 inches. The feedwater level control system was placed in manual operation and the normal 160 inch level was restored. Concurrent with these actions, CROs reduced reactor power via recirculation flow to 99 percent rated to account for the level perturbation. Reactor level was then controlled in "single element" pending troubleshooting of the observed level increase. In this configuration, the steam and feedwater flow anticipatory features associated with "three element" control are unavailable.

This event received a timely review by plant management, an event report was initiated, and troubleshooting was promptly commenced. The OM directed that level control be maintained in "single element" due to a suspected problem with the "three element" control function. During the subsequent Plant Manager's Morning Meeting, the plant management staff discussed the OM's operating decision, the use of the testing/troubleshooting instrumentation, and directed daily reports be made regarding the status of troubleshooting.

The inspector reviewed operating procedure OT 3114, Reactor High Water Level, the Final Safety Analysis Report (FSAR) and confirmed that the CRO actions were in accordance with procedural requirements. Reactor water level control measures were found appropriate and the inspector verified that the level transient was small and well controlled. Following a number of days of troubleshooting and system performance monitoring (without the identification of a definitive cause for the level perturbation, although the three to single element selector switch remains suspect) level control was restored to "three

element." The inspectors identified no conditions adverse to safe plant operations and continue to monitor VY's efforts to address this problem. The test instrumentation installed to monitor and record the performance of the "three element" reactor feedwater level control circuit was implemented by a temporary modification (TM) and included appropriate management reviews.

3.0 MAINTENANCE

3.1 Maintenance

The inspectors observed selected maintenance on safety-related equipment to determine whether these activities were effectively conducted in accordance with VY Technical Specifications (TS) and administrative controls (Procedure AP-0021 and AP-4000), approved maintenance 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.

In addition to the maintenance activities discussed in detail in the subsequent sections, the emergent maintenance on a safety relief valve bellows alarm circuitry was appropriately planned and conducted; the evaluation of higher-than-normal temperature of relays in the high pressure coolant injection and reactor building ventilation system logic systems was prompt and focused on operability; and, mock-up training for corrective maintenance on the "B" reactor water cleanup (RWCU) pump contributed to effective maintenance. Improved RWCU pump maintenance was demonstrated by improved lifting and handling methods, sequencing of maintenance, and worker knowledge of the activities to be performed. The inspectors considered the mock-up training a good initiative.

3.1.1 "A" Emergency Diesel Generator Maintenance

This period VY voluntarily removed the "A" EDG from service for preventive and minor corrective maintenance. Vermont Yankee performed the maintenance in accordance with their approved EDG maintenance procedures, had onsite technical assistance from the EDG vendor, and used around-the-clock engineering/supervisory oversight during the EDG outage window. Technical Specifications permit a 7-day allowed outage time, of which approximately a 4-day period is used to conduct limiting condition for operation (LCO) maintenance. The 4-day maintenance period was completed, as scheduled, and post-maintenance testing was appropriately conducted.

The inspectors observed and independently verified a number of maintenance activities. Within the EDG electrical panels, good housekeeping was noted and no discoloration of relays and control circuits was identified. With the exception of one control wire bundle (which was subsequently corrected), wire bundles were well supported and clear of associated control devices. Control panels were seismically supported, ventilation louvers were clear of obstruction, and gasket material was present to preclude water intrusion. Mechanical components, such as the vertical drive, the upper and lower cranks, and fuel oil system components, were also inspected and found in good material condition. However, the inspectors noted that an excessive amount of

lubricating/fuel oils had accumulated prior to the maintenance outage, in the drip pans below the "A" EDG. Although the exact source and cause of the leakage was unknown, at the end of the inspection period the VY maintenance staff tilted the pans towards the drain to prevent oil buildup, repaired a small oil leak near the air start distributor cam, and made plans to inspect and evaluate leakage on a monthly basis. Foreign material exclusion controls were evident.

Based on maintenance records and interviews with cognitive Maintenance Department personnel, the inspector determined that a number of other maintenance staff identified deficiencies were properly resolved. A "tripped" molded-case circuit breaker for the local voltage control variac was investigated for cause and tested prior to restoring it to operation. Although VY could not determine the root cause of the tripped condition, the evaluation of as-found electrical conditions and the troubleshooting conducted provided reasonable confidence that the breaker and associate voltage control circuit would perform satisfactory. A second deficient condition, involving a generator protection over-current relay, was also identified and replaced with a bench-tested spare. A failure evaluation was initiated via the Event Report System and assistance from the relay vendor was being pursued. A periodic surveillance was initiated to check the relays on both the "A" and "B" EDGs during plant operation. The other over-current relays tested satisfactory.

A low resistance on the generator-end insulated sleeve bearing (ISB) was detected and properly resolved. Based upon discussions with the EDG vendor (COLTEC, Fairbanks-Morse), VY's evaluation of other bearings, and VY's implementation of a monthly on-line surveillance, reasonable assurance that further degradation could be identified and evaluated prior to failure was provided. VY has preliminarily determined that low resistances were caused by conductive contaminants within the ISB lubricating oil. The maintenance staff also discovered, based upon vendor literature, that a "discretionary use" insulating washer was not installed. Although the insulating washer could enhance ISB resistance, VY determined that the washer was not necessary for EDG operability or reliability. Documentation of the discretionary use of this washer was not found. A replacement washer shipped to VY by the vendor was not installed due to a geometry deviation identified during receipt inspection. The inspector determined that the ISB oil was not part of the current lubricating oil analysis program because of the inability to easily sample this oil. However, the inspector determined that the maintenance staff was evaluating the feasibility of a minor modification to facilitate sampling.

In summary, the "A" EDG maintenance was well controlled. Appropriate supervision (see Section 6.1 regarding a related topic), resolution of identified discrepancies, and plant management review of this LCO maintenance were performed. The maintenance plan included an assessment of the risk associated with removing the "A" EDG from service as applied to: core damage frequency; unavailability of other ECCS systems; and in light of the current deficiencies in VY's Safe Shutdown Capability Analysis (reference NRC Inspection Report 95-19). Based on VY's Probabilistic Risk Assessment, other systems determined to have risk significance based on "A" EDG dependency (such as the Vernon Tie Line, diesel driven fire pump, and high pressure injection systems) were verified operable before and during the "A" EDG LCO maintenance.

The inspector concluded that the lack of documentation on the optional use of the insulating washer represented diminished configuration control, but this oversight appears isolated and not indicative of a programmatic problem. The accumulation of oils beneath the EDG and on horizontal surfaces was observed to have been a decline in acceptable housekeeping standards, but was properly resolved.

3.1.2 Maintenance Work Order Backlog and Trending Review

The inspector conducted an in-depth review of the safety related maintenance work order (WO) backlog and WO trending currently being performed by the VY staff. The administrative controls for the overall management of WOs is principally defined in Administrative Procedure (AP)-0310, "Surveillance, Preventative and Corrective Maintenance Program", and maintenance department procedure (DP)-0210, "Tracking and Trending Program". Within these procedures guidelines are established for periodic reviews by the maintenance staff of corrective and preventive maintenance WOs to assess the overall effectiveness of the maintenance program.

The inspector examined the various periodic (weekly, monthly, and year-end) maintenance trend reports to assess the degree of implementation and effectiveness of these internal program performance monitoring mechanism. Based upon follow-up discussions with responsible maintenance and operations planning supervisors and managers, the inspector determined that WO review and trending was being effectively conducted. Corrective maintenance WOs were being trended on a weekly basis by both the Instrumentation and Control (I&C) and the Maintenance (electrical and mechanical) departments. The trend reports were broadly disseminated for review by station managers and the inspector determined that the weekly trend reports were used by managers as a program oversight tool. The monthly and annual WO reviews were found to be appropriately documented and effectively used to revise preventive maintenance schedules and to address adverse equipment and personnel related maintenance trends (repetitive failures, rework, or untimely preventive maintenance).

The inspector also examined selected safety related systems' WO backlogs. The master WO backlog (printed 9/29/95) itemized 3096 individual work orders. This total list of WOs included: outage and non-outage items; safety and non-safety related equipment; corrective and preventive maintenance (including instrument calibrations); and WOs which had been worked, but not administratively closed. Each item was coded and categorized for ease of sorting. Of the nine selected safety systems, including high and low pressure injection systems and EDGs, the inspector did not identify any outstanding corrective or preventive maintenance which currently impacted system operability or reliability. The inspector determined that the Operation Planning Group examines weekly the entire WO backlog list to identify any adverse trends (component or system) and to highlight any longstanding WOs which warrant re-prioritization or further management attention. The inspector concluded that Work Order trending and backlog management by the VY staff was appropriate and that the prioritization of outstanding Work Orders was consistent with their safety impact.

3.2 Surveillance

The inspectors observed selected surveillance on safety-related equipment to determine whether tests were safely conducted in accordance with VY TS, administrative controls, and appropriate industry codes and standards, and that the plant staff was using approved procedures and safe equipment tagging practices. Interviews were conducted with the technicians, maintenance, and operations personnel.

In addition to the specific surveillance tests discussed in section 3.2.1, routine periodic testing was also observed. This testing included main steam isolation valve and turbine bypass valve stroke time testing and control rod exercising. During the rod pattern exchange on September 11, surveillance testing and gain adjustments of the average power range monitors (APRMs) were also observed. Effective periodic surveillance of rotating equipment was demonstrated when VY identified that the a brush rigging adjustment for the "B" rotating un-interruptable power supply was necessary to better mate the brush-to-slip ring seat. The applicable LCO was entered and the adjustment was completed with minimal out-of-service time.

3.2.1 High Pressure Injection Surveillances

The inspector observed VY perform routine quarterly surveillance of the reactor core isolation cooling (RCIC) and high pressure coolant injection (HPCI) systems. During the RCIC surveillance, the inspector observed activities within the control room. Field inspections were conducted during the HPCI surveillance test.

The inspector independently verified that precautions and prerequisites were met prior to the surveillance tests and that the system lineups supported HPCI and RCIC systems operation. During the HPCI surveillance, good performance was demonstrated by the auxiliary operator (AO). The AO performed a thorough pre-surveillance system walkdown and reviewed the surveillance test to familiarize himself with the procedure steps.

The inspector also observed: smooth operation of valves HPCI-21 and HPCI-24; a small steam leak at the HPCI turbine shaft seal which was being assessed by the Maintenance Department; appropriate lubricating oils flows; and proper calibration of test instrumentation. Radiation Protection technician performance is discussed in Section 5.1.1 of this report. Based on observations, interviews, and review of VY procedures, both surveillance tests were properly conducted.

4.0 ENGINEERING

4.1 Service Water Pinhole Leaks

As described in NRC Inspection Report 95-19, VY identified pinhole leaks in a section of service water (SW) pipe located in the torus room, evaluated this condition, and implemented a periodic monitoring program to assess the structural integrity of this piping. The NRC's review and approval of the VY

relief request from ASME code repair requirements was granted on October 12. The inspector noted that VY continues to perform weekly visual inspections and quarterly radiography of the affected area. The leakage rate also continues to be performed, trended, and evaluated. In accordance with guidance contained in Generic Letter 90-05, Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping, VY also performed structural assessments of five additional areas to determine the integrity of these pipe locations. No degraded conditions were identified.

Vermont Yankee has calculated an integrated leak rate of 0.00185 gallons/minute (gpm) from the pinhole leaks and has detected no further degradation of SW pipe wall thickness. The leak rate is significantly below VY's administrative limit of 5 gpm and is contained within a leak collection apparatus. An action level of 1 gpm was established to initiate management and engineering reviews. Radiography of the leak location and five additional areas have identified no degrading conditions. Based on interviews, plant operators are aware of this pipe degradation and its potential adverse impact of SW system operability.

The inspector notes that this particular leak area is unique because the flow and material configuration in this area would generally not make it susceptible to wall thinning mechanisms. The leak in the SW-18B pipe is subject to continuous SW flow and therefore not oxygen starved; its in a straight run of pipe and of low flow velocity; and, there is no weldament or pipe seam in the area. In particular, the degradation does not appear to represent historical (VY experienced) pipe wall degradation mechanisms of erosion, general corrosion, or microbiologically influenced corrosion (see Section 4.2). Vermont Yankee plans to evaluate this pipe section when it is removed for repair or replacement.

4.2 NRC Information Notice 94-79: Service Water Piping Corrosion

NRC Information Notice (IN) 94-79, Microbiologically Influenced Corrosion (MIC) of Service Water Piping, was issued November 23, 1994, to alert licensees of pinhole leaks discovered in SW piping at nuclear facilities. This IN discusses the known causes and mechanisms for MIC (a combination of material, oxygenation, and configuration) and then describes possible ways to prevent the onset of MIC, such as biocides and corrosion inhibitors.

Vermont Yankee has recently implemented a program to periodically treat the SW system with oxidizing (hypobromous acid) and non-oxidizing ("Clamtrol") biocides. Although its too early to tell whether this has improved system integrity or performance, VY continues to monitor the SW system to assess long-term changes. A strategic plan has been implemented to identify, inspect, and evaluate areas potentially vulnerable to this type of corrosion. Contingency plans were also being prepared to resolve identified deficiencies. VY has also taken the initiative to pursue the implementation of pipe thermography in an effort to further assess the structural integrity of piping systems. This initiative will be coordinated with the Electrical Power Research Institute efforts and is planned to be used (if found acceptable) to augment the existing piping non-destructive examination methods.

The inspector concluded that VY's assessment of NRC Information Notice 94-79 was thorough and focused on the long-term, continuous evaluation of SW piping integrity. This reflected a management commitment to the material preservation of this safety system and an appropriate implementation of industry experiences and lessons learned. The inspectors noted that VY currently does not chemically treat "dead legs" and "periodic flow lines." These include SW piping to the EDGs, main condenser emergency fill, and reactor vessel emergency fill. VY was still in the process of evaluating these SW piping configurations. The inspector verified that the above chemicals were approved in VY's National Pollution Discharge Elimination System (NPDES) permit for use and that the usage of biocides are acceptable as discussed in the Final Safety Analysis Report.

5.0 PLANT SUPPORT

5.1 Radiological Controls

Inspectors routinely observed and reviewed radiological controls and practices during plant tours. The inspectors observed that 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 radiologically control area.

5.1.1 Radiation Monitoring During System Testing

During the quarterly surveillance of the HPCI system, the inspector observed good RP technician performance. The technician's monitoring of changing radiation conditions directly resulted in reduced personnel radiation exposures in the HPCI room, because workers were directed to stand in lower dose rate areas and to maximize their distance from reactor steam piping. In addition, the RP technician questioned the maintenance personnel regarding which RWP they were working under and identified that one worker should have been for dose assignment purposes signed in under a more restrictive specific RWP, due to the higher radiation levels observed during the HPCI run.

5.1.2 Entry into a High Radiation Area Without Radiation Protection Coverage

This period, the "B" reactor water cleanup (RWCU) pump was tagged out for corrective maintenance. The radiation work permit (RWP 95-591) for this activity required continuous RP technician coverage due to the potential for changing radiological conditions caused by the maintenance. On September 6, the maintenance personnel read and signed the RWP. The personnel were also briefed on the radiological conditions by the RP staff prior to the work commencing.

On September 14 an RP Supervisor noted that two maintenance workers were in the "B" RWCU pump room without RP technician coverage. The work activity was stopped, the event was reported to plant management, and an Event Report was initiated. Immediate corrective actions included interviews with the individuals involved, an assessment of the procedural controls, Maintenance

and Radiation Department interactions during staff meetings, and disciplinary action. During a subsequent Plant Manager's Morning Meetings, the cause and corrective actions of the event were reviewed and discussed. The Plant Operations Review Committee also reviewed this occurrence and the inspectors were briefed on the details of this event and the initial corrective actions. Long-term corrective actions were in progress at the conclusion of this inspection period.

Vermont Yankee has preliminarily determined that the decision to enter the high radiation area was a cognitive error. The workers were knowledgeable of the particular RWP requirement, however, applied inappropriate latitude to the definition of "continuous" RP coverage. The workers were at the job site all morning with the "continuous" RP technician coverage, had returned from lunch, and were in the high radiation area for less than 15 minutes without the RP technician present, when discovered by the RP supervisor. Consequently, VY management took disciplinary action based upon this cognitive error.

The inspectors reviewed this occurrence and VY remedial actions. Corrective actions were timely and focused on the enhancement of Maintenance Department staff performance. The event and lessons learned were promptly communicated to the whole plant staff and emphasis was placed on the significance of the occurrence from a radiological and procedural adherence perspective. Based on interviews, the workers believed that the RP technician was on the way to the work area and rationalized that the "continuous" coverage RWP requirement was therefore satisfied. The inspectors also learned that there was no sense of urgency to complete the maintenance. However, work efficiency was a motivator. During the "B" RWCU pump maintenance, the work site was frequented by a maintenance foreman and a number of RP surveys were performed. The inspectors note that the workers acknowledged their errors and professionally assisted VY in their on-going root cause determination.

The inspectors determined that this event was isolated, based on a review of previous NRC inspection reports and VY Event Reports. However, pending the completion of VY's human performance root cause evaluation, any subsequent corrective actions, and inspector review of the same, this issue remains unresolved **(URI 95-21-01)**.

The inspector reviewed 95-591, and the associated surveys to assess the radiological safety significance of this event. The radiological conditions within the "B" RWCU pump room (survey map S95-04184) prior to the occurrence included general area radiation levels of 5-300 mr/hr, one contact dose rate of 600 mr/hr (300 mr/hr at 30 cm), and contamination levels of 5,000 to 80,000 cpm/100cm^2. No alpha or airborne radiation were present. Smearable beta radiation contamination levels existed at 2-4 mRad/hr/100 cm^2. The workers were in full anti-contamination clothing and had alarming dosimeters set at 300 mr/hr and 100 mrem cumulative. From interviews, the inspector determined that the workers were in a general radiation area of 5-80 mr/hr for less than 15 minutes.

Personnel radiological safety was reasonably assured due to the alarming dosimetry, identification of radiological hot spots, and the knowledge possessed by the workers of the current radiological conditions (both workers were in the area earlier in the day and were familiar with the radiation survey results). In addition, no maintenance or plant operations had been conducted that had the potential for changing the radiological conditions between the time of the last RP technician coverage and the occurrence (approximately 12:30 pm). The workers were required to read their dosimeter every 30 minutes. Based on the above, the inspector concluded that the radiological significance of this event was low.

5.2 Emergency Plan Exercise

On September 13, an Emergency Plan exercise was held. This full participation exercise included State, Local, and NRC officials, and the complete activation of VY's emergency response facilities. Protective action recommendations were coordinated with State officials and emergency communications were implemented and continuous. NRC assessment of VY's performance was discussed with the licensee on September 14 and during a pubic meeting at the Vernon Town Hall on September 19. Findings will be documented in NRC Inspection Report 95-20.

5.3 Security

The inspector verified that security conditions met or exceeded regulatory requirements and the VY Physical Security Plan. Physical security was inspected during regular and deep backshift hours to verify that controls were in accordance with the security plan and VY procedures. In particular, the inspectors observed that positive access control was provided at the personnel and vehicle access points to the Protected Area. Personnel, packages, and vehicles were properly inspected and security guards were attentive to duty. Observations within the Secondary Alarm Station confirmed detailed surveillance camera acuity and alarm system functionality.

The inspectors were briefed this period on the installation of new vehicular barriers. These fortified barriers were being installed outside of the Protected Area fence to provide improved security effectiveness against radiological sabotage of the facility in accordance with 10 CFR 73.55 (c)(7) and (c)(8). Based on plant tours and discussions with the security staff, security compensatory measures implemented during barrier construction were appropriate.

5.4 Compensatory Fire Watch Review

As documented in NRC inspection report 95-19 (refer to sections 4.2 and 5.4), compensatory fire watches have been established since late July 1995 for deficiencies identified in the 10 CFR 50, Appendix R safe shutdown design capabilities. Inspection report 95-19 also documented that in August 1995, an error resulted in the ineffective implementation of one of these compensatory fire watches. This error was attributed to the ineffective translation of engineering information into clear and detailed fire watch instructions. During this inspection period, the VY staff identified, on August 28, another

failure to properly implement an Appendix R compensatory fire watch. Again, ineffective communication was identified as a contributing cause for the missed fire watch.

Based upon the broad programmatic Appendix R and fire protection program issues being addressed by the VY staff (reference NRC inspection report 95-19, section 4.2) the inspectors will examine this specific fire watch problem within the frame work of VY's overall response, once that effort is completed. Accordingly, pending completion of the ongoing VY root cause/human performance review of the Appendix R and Fire Protection Program implementation issues, this item remains unresolved **(URI 95-21-02)**.

Immediate corrective actions implemented by the VY staff for the above fire watch problem included: re-establishment of the correct fire watch; a complete review of all outstanding fire permits (no additional discrepancies noted); and all future Appendix R fire permits shall be reviewed by the Technical Programs Manager (temporary assigned single point of accountability and responsibility for day-to-day fire protection program implementation.

5.5 Housekeeping and Material Condition

Overall, the housekeeping in the vicinity of structures, systems, and components required for safe reactor plant operation was good. The HPCI, RCIC, EDG, and standby gas treatment systems were inspected in detail. Within these areas, no transient or un-controlled combustible materials were observed. Piping insulation and supports were intact and structurally sound. Air ports for air-operated valves were un-obstructed and solenoid operated valves did not indicate excessive heating. During the "A" EDG maintenance, housekeeping was commensurate with the work in progress and cleaning materials were identified and controlled. Within the upper and lower crank cases and vertical drive housing of the EDG, no foreign material was observed and foreign material exclusion controls were noted. One weakness in housekeeping was the excessive accumulation of fuel and lubricating oils under the "A" diesel (see Section 3.1.1). This condition was of particular concern because it represented an increase in free combustibles under the "A" EDG.

The radioactive waste treatment area, iso-phase buses, feedwater pump area, and main turbine generator lubricating oil system were also inspected. Although these systems are not safety-related, proper operation contributes to plant safety through the prevention of plant transients and unnecessary operator challenges. Within these areas, good housekeeping was also observed as evidenced by uncluttered accesses, proper storage of materials, and overall cleanliness.

6.0 SAFETY ASSESSMENT AND QUALITY VERIFICATION

6.1 Maintenance Department Personnel Performance

The inspectors reviewed two occurrences this period in which Maintenance Department personnel demonstrated poor work practices due to cognitive errors. In the first case, two workers in-appropriately entered a high radiation area without RP technician coverage (reference Section 5.1.2). The second case

involved two different maintenance workers observed on September 11 in the "A" EDG room. The inspectors observed that one of the two workers was standing on top of the operable "A" EDG without personnel fall protection. The inspector determined that this activity was being conducted in preparation for the "A" EDG LCO maintenance, but without the knowledge of the shift supervisor. Although both occurrences were of low plant safety consequence, they demonstrated inappropriate VY work control and safety practices procedures. Inspector follow-up of this personnel performance trend will be conducted in conjunction with unresolved item URI 95-21-01.

6.2 (Updated) VIO 94-13-01: Plant Operations Review Committee Effectiveness

The inspectors observed three Plant Operations Review Committee (PORC) meetings to assess their TS audit and review effectiveness. The committee meetings observed were held on August 2, 3, and 22. The August 2 meeting was a non-routine PORC that focused on the status of Appendix R deficiencies (reference NRC Inspection Report 95-19). During this meeting, PORC members demonstrated a good questioning attitude in their review of the current Appendix R deficiencies and status of corrective actions. In particular, each reactor building (RB) zone that was identified to have Appendix R deficiencies was discussed in detail by thought provoking "what if" situations, an assessment of VY's Safe Shutdown Capability Analysis assumptions, and a focus on the potential effects on plant operations. The PORC also questioned the qualifications and experiences of the individuals assigned to the Appendix R task teams and challenged the dates established for completing the corrective actions. A good PORC initiative involved their recommendation for thermographic investigation of electrical power cabling in the vicinity of the Appendix R components to identify potential fire hazards.

The second PORC meeting, August 3, focused on current plant operations to detect potential safety hazards. The inspector noted considerable discussions during PORC's review of: Licensee Event Report (LER) 94-16, SW pinhole leaks near the RB closed cooling water heat exchangers; a proposed repair plan of a fire wrap in the cable vault; and, LER 95-05, the failure to perform a shutdown margin reactivity calculation prior to performing control rod drive maintenance. The effectiveness of PORC's reviews and audits for these issues was demonstrated by their focus on plant safety and the assurance of quality in station activities. For example, during the UT measurements of SW pipe thickness, VY identified that some UT results were non-conservative with respect to actual micrometer measurements. PORC questioned the generic aspects of this issue focusing on the UT technique and the possibility that other UT results could be non-conservative. PORC recommended that this issue receive additional review. A generic focus was also exhibited in PORC's review of VY staff's repair of the fire wrap. PORC was particularly interested in whether the quality controls applied to this vendor conducted activity would meet or exceeded VY quality control standards. Other considerations included Quality Services Group involvement and the assignment of plant responsibility.

The August 22 PORC was of particular interest to the inspectors because a PORC-Subcommittee (PSC) presentation was made. As described in plant procedure AP 0030, "The Plant Operations Review Committee," the PSC reviews proposed plant procedures or revisions and recommends to PORC whether to approve or disapprove the particular proposal. The PSC is independent of PORC and provides a technical as well as an administrative review of proposed changes based on TSs, FSAR, licensing commitments, and industry lessons learned.

The inspector reviewed the PSC procedure review package (No. 95-26) and assessed the PSC presentation at the August 22 PORC. Overall, the PSC minutes were detailed and were informative with respect to the proposed procedure changes. For example, further clarification and administrative controls were established in the Event Reporting System to enhance the management of this corrective action system. The control rod drive operating procedure was revised to establish an upper pressure limit for hydraulic control unit pressure. This revision was well justified based on equipment safety, reliability, and an industry experience review. A revision to the VY 4 KV electrical system procedure was also based on an industry experience review. This industry review involved NRC Information Notice 93-91 which was used to assist in the evaluation of a potential common-mode problem with auxiliary switch contacts. The justifications for the revision of Instrument and Controls procedures were also of similar quality.

In summary, the inspector concluded that PORC focused on plant safety and demonstrated a questioning attitude. The PORC sub-committee recommendations were well justified and considered the need for safety evaluations, changes to the Quality Assurance Manual (YO-QAP-1-1A) and FSAR, and effect on licensed conditions.

7.0 INSPECTION ADMINISTRATION

7.1 Review of Written Reports

The below listed reports were reviewed for accuracy and assessment of reported conditions and parameters.

Report of Failed Fuel Status and Parameter Trends for July 1995 - This report trended radioactive isotopic concentrations and other fuel performance indicators and concluded that fuel clad defects have not occurred in the current cycle. This assessment was based, in part, on steam jet air ejector offgas rate, reactor coolant activity, dose equivalent iodine, and short lived isotopic concentrations. The inspector reviewed these and other trended parameters and identified no concerns.

June 1995 Monthly Statistical Report
The plant operating data and narrative summary of this report with one exception, accurately reflected plant operating statistics and shutdown experiences in accordance with TS 6.7.A.3. The report appropriately detailed changes in main turbine generator electrical performance due to the turbine upgrades implemented during the 1995 refueling outage (NRC Inspection Report 95-06). The inspector brought to VY's attention that the June 19 reactor

power reduction due to an unanticipated loss of one offsite power line was forced and not due to "Maintenance or Test," as stated in the report. As discussed in NRC Inspection Report 95-17, the power reduction was performed to preclude electrical grid stability problems following the loss of the Scobie offsite power line due to a lighting strike. Vermont Yankee acknowledged this observation and plans to submit a revision to the report.

7.2 NRC Management Visit

On September 11, William F. Kane, Deputy Regional Administrator, Region I, and Mr. Philip McKee, Project Directorate, NRR, toured Vermont Yankee. During this tour, they held discussions with VY plant and corporate management regarding the SALP report, current plant operations, and licensee initiatives to improve performance.

7.3 Management Meetings

On September 12, the NRC held a public meeting at the Vernon Town Hall with VY management to discuss the NRC Systematic Assessment of Licensee Performance (NRC Report 95-99). This report, issued August 28, summarized the NRC's assessment of VY performance during the period January 16, 1994, to July 15, 1995. A question and answer period and VY senior management response followed the NRC's presentation. The NRC slides presented at this meeting are enclosed as Attachment 1.

7.4 Preliminary Inspection Findings

Meetings were held weekly with VY management during this inspection to discuss inspection findings. A summary of preliminary findings was also discussed on October 20, prior to report issuance. No proprietary information was identified as being included in this report.

ATTACHMENT I: SALP Management Meeting Slides

UNITED STATES
NUCLEAR REGULATORY COMMISSION

SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE (SALP)

VERMONT YANKEE NUCLEAR POWER STATION

ASSESSMENT PERIOD: JANUARY 16, 1994 - JULY 15, 1995
BOARD MEETIN 3: JULY 27, 1995
MANAGEMENT MEETING: SEPTEMBER 12, 1995

Agenda

NRC Introductory Remarks:	W. F. Kane Deputy Regional Administrator
VYNPC Introductory Remarks:	G. Weigand President and CEO
NRC SALP Process and Results:	S. Shankman Deputy Director, Division of Radiation Safety and Safeguards
VYNPC Response to Each Area	
VYNPC Closing Remarks:	G. Weigand
NRC Closing Remarks:	W. F. Kane
Public Questions and Answers:	NRC

Objectives of the SALP Program

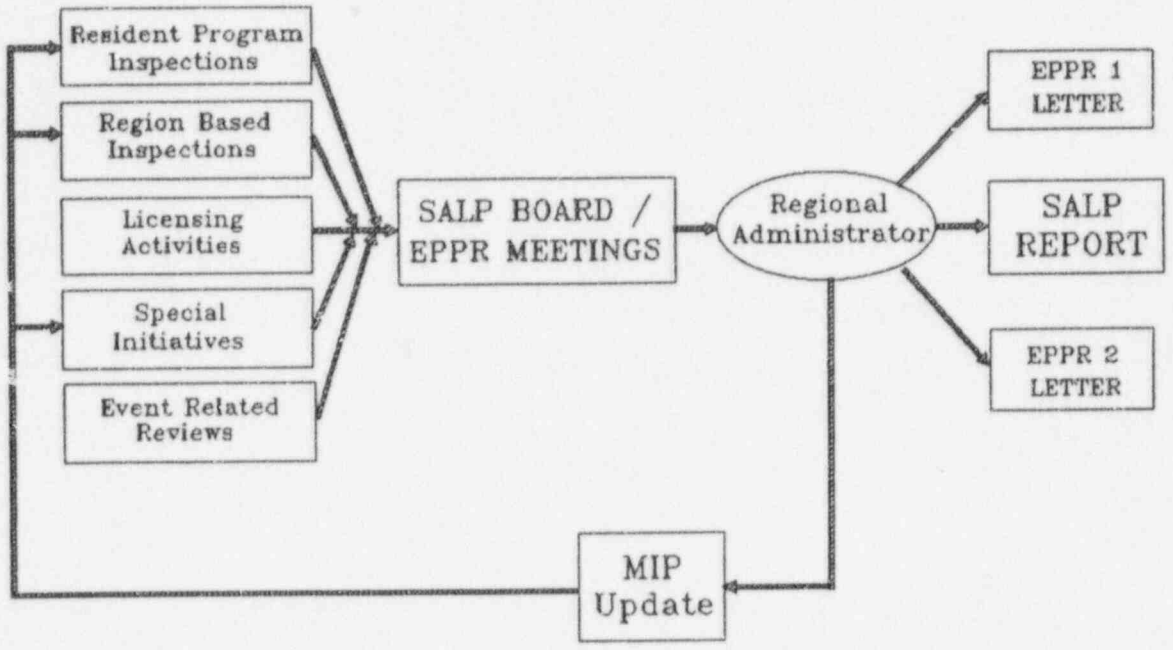
1. Conduct an Integrated Assessment of Licensee Safety Performance that Focuses on the Safety Significance of the NRC Findings and Conclusions During the Assessment Period.

2. Provide a Vehicle for Meaningful Dialogue with the Licensee Regarding its Safety Performance Based on the Insights Gained from Synthesis of NRC Observations.

3. Assist NRC Management in Making Sound Decisions Regarding Allocation of NRC Resources Used to Oversee, Inspect, and Assess Licensee Performance.

4. Provide a Method for Informing the Public of the NRC's Assessment f Licensee Performance.

SALP / EPPR PROCESS



EPPR - EXECUTIVE PLANT PERFORMANCE REVIEW
MIP - MASTER INSPECTION PLAN

CHAIRMAN: SUSAN SHANKMAN, DEPUTY DIRECTOR, DIVISION OF RADIATION SAFETY AND SAFEGUARDS

MEMBERS: JAMES T. WIGGINS, DIRECTOR, DIVISION OF REACTOR SAFETY

RICHARD W. COOPER, II, DIRECTOR, DIVISION OF REACTOR PROJECTS

PHILLIP F. MCKEE, DIRECTOR, PROJECT DIRECTORATE I-4, OFFICE OF NUCLEAR REACTOR REGULATION (NRR)

The Vermont Yankee Resident Staffing Included One SRI and One RI for the Full Period.

PERFORMANCE ANALYSIS AREAS FOR OPERATING REACTORS

- Plant Operations
- Engineering
- Maintenance
- Plant Support
  - Radiological Controls
  - Emergency Preparedness
  - Security
  - Fire Protection
  - Housekeeping

PERFORMANCE CATEGORY RATINGS

CATEGORY 1: SUPERIOR PERFORMANCE

- PROGRAMS AND PROCEDURES PROVIDE EFFECTIVE CONTROLS
- SELF-ASSESSMENT EFFORTS ARE EFFECTIVE
- CORRECTIVE ACTIONS ARE COMPREHENSIVE
- MINIMUM INSPECTIONS TO VERIFY SAFETY

CATEGORY 2: GOOD PERFORMANCE

- PROGRAMS AND PROCEDURES NORMALLY PROVIDE CONTROLS
- SELF-ASSESSMENT EFFORTS ARE GOOD - EMERGING ISSUES
- RECURRING ISSUES
- ADDITIONAL INSPECTION TO ASSESS PERFORMANCE

CATEGORY 3: ACCEPTABLE PERFORMANCE

- PROGRAMS AND PROCEDURES PROVIDE SUFFICIENT CONTROL
- SELF-ASSESSMENT EFFORTS ARE REACTIVE
- CORRECTIVE ACTIONS ARE NOT THOROUGH
- SIGNIFICANT NRC AND LICENSEE ATTENTION REQUIRED

PERFORMANCE ANALYSIS

FUNCTIONAL AREA	RATING LAST SALP	RATING THIS SALP
Plant Operations	2	2
Maintenance	2	2
Engineering	2	2
Plant Support	1	1

PLANT OPERATIONS
Category 2

- CONTINUED STRONG OPERATOR PERFORMANCE
- EFFECTIVE MANAGEMENT OF SHUTDOWN RISK
- SIGNIFICANT IMPROVEMENT SINCE THE LAST SALP
- NOTE /ORTHY EXAMPLES OF INEFFECTIVE RESPONSE TO IDENTIFIED PROBLEMS

MAINTENANCE
Category 2

- MANAGEMENT OVERSIGHT GENERALLY EFFECTIVE
- PERSONNEL DEMONSTRATED EXCELLENT SKILLS BUT ERRORS HAVE HAD IMPACT ON OPERATIONS
- IMPROVED MAINTENANCE AND TESTING PROGRAMS
- GOOD MAINTENANCE & SURVEILLANCE PROGRAMS - EXCEPTIONS IDENTIFIED
- WEAK EVALUATION OF "AS-FOUND" TEST CONDITIONS
- WEAK PERFORMANCE TRENDING

ENGINEERING
Category 2

- GENERALLY POSITIVE RESULTS FROM ENGINEERING MANAGEMENT OVERSIGHT AND ATTENTION
- GENERALLY STRONG PERFORMANCE ON TECHNICAL ISSUES
- MIXED PERFORMANCE IN CONDUCT OF OPERABILITY & SAFETY REVIEWS
- IMPROVED USE OF CURRENT INDUSTRY OPERATING EXPERIENCE
- WELL DEVELOPED TEMPORARY MODIFICATION (TM) PROGRAM BUT SOME IMPLEMENTATION PROBLEMS
- EFFECTIVE USE OF OUTSIDE EXPERTISE REFLECTS IMPROVEMENT IN ENGINEERING AREA SELF-ASSESSMENT
- WEAKNESS IN CONFORMANCE TO 10 CFR PART 50 APPENDIX R REQUIREMENTS
- WEAKNESS IN MOTOR OPERATED VALVE TESTING PROGRAM

PLANT SUPPORT
Category 1

- OVERALL PLANT SUPPORT FUNCTIONS SUBSTANTIALLY CONTRIBUTED TO SAFETY
- CONTINUED EXCELLENT RADIATION CONTROLS
- EFFECTIVE CONTROL OF RADIOLOGICAL MATERIALS
- CONTINUING WEAKNESS WITH HIGH RADIATION AREA CONTROL
- STRONG ENVIRONMENTAL & EFFLUENT MONITORING
- CONTINUED EFFECTIVE EMERGENCY PREPAREDNESS PROGRAM
- STRONG SECURITY PROGRAM
- STRONG PERFORMANCE IN FIRE PROTECTION PROGRAM IMPLEMENTATION DIMINISHED BY 10 CFR 50 APPENDIX R WEAKNESSES
- EXCELLENT HOUSEKEEPING & CLEANLINESS

OVERALL SUMMARY

- STRONG MANAGEMENT OVERSIGHT AND INVOLVEMENT IN PLANT ACTIVITIES
- STRONG PLANT STAFF KNOWLEDGE
- CRITICAL REVIEW OF ACTIVITIES BY OFFSITE COMMITTEE AND QUALITY ASSURANCE
- CORRECTIVE ACTION AND SELF-ASSESSMENT PROGRAMS MUCH IMPROVED
- ONSITE SAFETY REVIEW IMPROVING
- CONTINUED ATTENTION NEEDED FOR: ONSITE SAFETY REVIEW PREPARATIONS AND EVENT REPORT SYSTEM ROOT CAUSE/TRENDING ANALYSIS

Overview

- Plant Performance
- Plant Operations Review Committee
- Event Report Process

Operations

- Training
- Procedure Improvements
- Improved Response
- Technical Specifications

Maintenance

- Planning and Scheduling
- Human Performance Initiatives
- Industry Initiatives
- Preventive Maintenance
- Maintenance Rule

Engineering

- Oversight of Engineering Efforts
- Design Basis Enhancements
- Minor Modification Process
- Engineering Reorganization

Plant Support

- Industrial Safety
- Worker Radiation Protection
- Security Self-Assessment

Quality

- Compliance to Performance Based Approach
- Resource Management
- Ownership