MAY 16 1991

Docket No. 50-309

Maine Yankee Atomic Power Company
ATTN: Mr. Charles D. Frizzle
President
83 Edison Drive
Augusta, Maine 04336

Gentlemen:

Subject: **Maine Yankee Systematic Assessment of Licensee Performance (SALP) for November 1, 1989 to February 28, 1991 (50-309/89-99)**

The enclosed report documents the NRC SALP Board evaluation of the safety performance of the Maine Yankee Atomic Power Plant. We plan to meet with you on-site on May 22, 1991, to discuss this SALP. At that meeting, please be prepared to discuss our assessment and any plans you have to improve performance.

Overall, this SALP found safe and conservative operation, with significant improvements in Security and in Radiological Controls. However, deficiencies in performance of infrequent activities in several areas indicate a need to improve procedural controls to reduce reliance on individual performance.

On April 29, 1991, after the April 17, 1991 SALP Board meeting, a main transformer fault and main generator hydrogen fire occurred. NRC review of this event is expected to produce findings relevant to all SALP areas. Preliminary evaluation indicates that no change in these SALP ratings would result from consideration of the April 29, 1991 event.

Please provide your written comments on the SALP, if any, within two weeks following our on-site SALP discussion meeting. Upon consideration of your comments, we will issue the Final SALP Report.

The enclosed report is being placed in the Public Document Room.

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MAY 16 1991

Thank you for your cooperation.

Sincerely,

ORIGINAL SIGNED BY
WILLIAM F. KANE

Thomas T. Martin
Regional Administrator

Enclosure: NRC SALP Report 50-309/89-99

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ENCLOSURE 1

U.S. NUCLEAR REGULATORY COMMISSION

REGION I

SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE (SALP)

SALP REPORT 50-309/89-99

MAINE YANKEE ATOMIC POWER COMPANY

NOVEMBER 1, 1989 - FEBRUARY 28, 1991

TABLE OF CONTENTS

SUPPORTING DATA AND SUMMARIES

1. INTRODUCTION

Systematic Assessments of Licensee Performance (SALPs) are integrated NRC staff evaluations of safety performance based on NRC observations and data. SALPs supplement NRC assessments of compliance with NRC requirements. Each SALP is intended to be sufficiently diagnostic to support decisions for allocating NRC resources and to provide meaningful feedback to licensee management on the quality and safety of plant operation.

On April 17, 1991, in accordance with NRC Manual Chapter 0516, an NRC SALP Board met to assess the November 1, 1989 to February 28, 1991 performance of the Maine Yankee Atomic Power Plant. The SALP Board attendees were:

Board Chairman

J. Wiggins, Deputy Director, Division of Reactor Projects (DRP)

Board Members

M. Knapp, Director, Division of Radiation Safety and Safeguards (DRSS)
W. Lanning, Deputy Director, Division of Reactor Safety (DRS)
C. Marschall, Senior Resident Inspector, DRP
E. McCabe, Chief, Reactor Projects Section 3B, DRP
E. Trottier, Project Manager, PD I-3, Office of Nuclear Reactor Regulation (NRR)
R. Wessman, Director, Project Directorate I-3, NRR

Other Attendees (part-time)

R. Bores, Chief, Environmental Radiation Protection Section (ERPS), DRSS
C. Conklin, Senior Emergency Preparedness Specialist, Emergency Preparedness Section (EPS), DRSS
R. Cooper, Deputy Director, DRSS
T. Dexter, Physical Security Inspector, Safeguards Section (SS), DRSS
M. Hodges, Director, DRS
R. Keimig, Chief, SS, DRSS
J. Kottan, Laboratory Specialist, ERPS, DRSS
W. Lazarus, Chief, EPS, DRSS
R. Nimitz, Senior Radiation Specialist, Facilities Radiation Protection Section (FRPS), DRSS
W. Pasciak, Chief, FRPS, DRSS

II. SUMMARY

II.A Facility Performance

Functional Area	8/1/88 - 10/31/89 Category/Trend	11/1/89 - 2/28/91 Category/Trend
1. Plant Operations	1	1, Declining
2. Radiological Controls	2	2
3. Maintenance/Surveillance	1	1
4. Emergency Preparedness	2, Improving	2
5. Security and Safeguards	2	2, Improving
6. Engineering and Technical Support	2	2
7. Safety Assessment/Quality Verification	2	2

II.B Overall Facility Evaluation

Overall, this SALP found Maine Yankee performance to be safe and conservative. Plant Operations and Maintenance/Surveillance were rated as superior, and the other five areas were rated as good. Stronger management overview of Security was accompanied by improvements in all aspects of the program, with protected area lighting, intrusion detection, access controls, and response controls being notable examples. Radiological Controls improvements were evident in organization changes, additional staffing, and control over radiation exposures during outages.

While rated superior overall, a declining trend was found in Plant Operations. This involved operator errors which resulted in an unintended reduction in Reactor Coolant System (RCS) inventory during RCS vent and fill and in generation of a safety injection action signal while shut down. In addition, a recirculation action signal was initiated, while shut down, because of failure to maintain requisite plant conditions when a surveillance was interrupted. Such errors, if continued unchecked, could lead to a lower performance rating in the next SALP cycle.

There were no reactor trips. Eleven reactor shutdowns occurred. Two of these were conservative, but four were due to long-standing design deficiencies and four more appeared to be due to design-related equipment failures. Collectively, these indicate a need to improve design control based on operating experience.

An attempt to repair a containment isolation valve at power resulted in a small but unisolable main steam leak which necessitated shutting down to repair. Also, despite radiological controls improvements, inadequate control over work on a valve produced significant unplanned radiation exposures to three workers. In addition, exposure controls for steam generator and primary component cooling work were weak. These factors and the personnel-induced safety signals noted above indicated problems in performing infrequent evolutions. That, in turn, was evaluated as indicative of over-reliance on individual performance.

III. PERFORMANCE ANALYSIS

III.A. Plant Operations

III.A.1 Analysis

This area was previously rated Category 1 based on a demonstrated strong orientation toward safe operation, with good management involvement and oversight. The Operations Department exhibited professionalism and technical and operational competence.

During this period, management involvement in operations continued to be strong. Operations matters were effectively brought to the attention of licensee management in the Morning Managers Meetings. During these meetings, the on-shift Plant Shift Supervisors (PSSs) actively demonstrated a questioning attitude toward plant activities. Issues were openly discussed and actions for resolution assigned.

Safety conservatism was evident. For example, management direction on actions to be taken during increased primary system leakage resulted in procedural controls that were conservative compared to the Technical Specifications. Then, during a rapid increase in primary to secondary leakage, the operators proficiently performed a timely shutdown, minimizing the effect of a steam generator tube failure. Also, during the refueling shutdown, temporary cooling was provided for the spent fuel pool by portable heat exchangers. Emergency diesel generator surveillances and detailed planning of a medium voltage electrical bus reinsulation effort assured that reliable power was available for shutdown cooling.

There were no plant trips during this period. A forced outage resulted from a conservative response to suspected main generator exciter seal ring leakage. Also, operators conducted emergency shutdowns, without incident, for the Reactor Coolant Pump seal failure in November 1989 and the Steam Generator Tube leak in December 1990. These accomplishments indicated strong operations performance.

Staffing was sufficient to allow minimal use of overtime for shift coverage. During periods of high workload, there was a need to use overtime to accomplish procedure revisions, maintenance authorizations, safety tagging, and long-term operations projects, but appropriate management of overtime was evident.

In March 1990, the NRC conducted a requalification program evaluation. Six of the seven operators examined passed all portions of the examination. (Based on the small sample, program evaluation was deferred.) The evaluation determined that one of the licensee's training instructors had been exempted from the required annual operating test as allowed by their requalification program but in violation of 10 CFR 55.59. Licensee management immediately restored the requalification program to compliance with 10 CFR 55.59(a)(2) upon NRC identification of the discrepancy. An NRC administered initial examination was conducted in August 1990. All nine candidates passed and only minor SRO and RO generic

weaknesses were identified. One requalification simulator re-examination was administered and a passing grade was achieved. The high success rate on NRC-administered operator examinations indicated good training and qualification of operators.

A high voltage switching error, early in the SALP period, was the result of weak training on switching and poor communications between the control room and in-plant operators. Further, one Safety Injection Actuation System (SIAS) actuation and one Recirculation Actuation Signal (RAS) actuation occurred during the refueling outage. The SIAS actuated when an operator manipulated the wrong breaker, de-energizing two vital busses. Licensee root cause evaluation appropriately addressed the principal contributors, including inadequate labels, an insufficiently detailed procedure and the SIAS actuation relays being operable when they were not needed. The RAS actuation occurred after an SIAS logic verification surveillance conducted by Instrument and Control (I&C) technicians was halted in progress. When technicians resumed the surveillance four days later without reverifying that the required initial conditions existed, plant condition changes resulted in the RAS actuation and a momentary loss of Residual Heat Removal (RHR). (This involved Emergency Core Cooling suction valve alignment to the containment sump, with no plant effect except tripping of the running RHR pump.) Maine Yankee's corrective actions included changes to the associated surveillance and operations procedures, a reinforcement of the practice of reverifying procedure prerequisites when work resumes after a delay, and addition of "surveillances in progress" to operations turnovers.

During Reactor Coolant System (RCS) venting and filling, an inadvertent reduction in RCS inventory reduced the margin to interruption of RHR. A root cause was inadequate procedural guidance on the return to service of pressurizer instrumentation. As a result, misleading pressurizer level indication was provided to the operators. Operators were aware of disparate level indications but continued the evolution without resolving the disparity. Also, operators reduced pressurizer level by a means not authorized under existing conditions. These were anomalous but notable instances of poor operator performance. Procedure inadequacies contributed to these errors. Senior licensee management attention to this matter was evident; the licensee President placed a hold on plant start-up until the root cause was addressed to his satisfation.

The above events revealed weaknesses in: the quality of infrequently used, albeit routine outage-related procedures; attention to detail in procedure implementation and revision; and communications between the control room and in-plant operators. Communication within the operating crews improved after management emphasis.

In summary, management involvement and oversight of plant operations continued to be strong. Operations personnel demonstrated technical competence and professionalism. Staffing was appropriate. Operations procedures and their implementation were adequate. Operator training, analysis of events and corrective actions were generally strong based on few operational events and their non-repetitive nature. However, the personnel errors and minor events which were noted during this period indicated a declining performance trend.

III.A.2 **Performance Rating**: Category 1, Declining

III.B. Radiological Controls

III.B.1 Analysis

Radiological controls was previously rated Category 2. Radiation protection performance had improved. There were upgrades to the organization and its capabilities, improved efforts to reduce radiation exposures, and effective effluent and environmental monitoring programs. Weaknesses included continued lapses in adhering to radiation protection requirements and in completing radwaste shipping manifests. Self-identified and NRC-identified concerns were addressed by establishing a Radiation Protection Improvement Plan (RPIP) and completing its specified independent, in-depth self-assessment.

Radiation Protection

NRC review of external and internal exposure controls identified inconsistent performance. Very good radiological controls were implemented for reactor thermal shield work, a task involving divers working close to the highly radioactive thermal shield. However, radiological controls for tasks such as steam generator work and primary component cooling (PCC) valve work were weak in basic occupational exposure controls including inter- and intra-departmental communications. Reviews of PCC valve work identified problems in the radiation work permit program, the High Radiation Area exposure control program, and the radiological work control program. Lack of understanding of work scope and job coverage requirements for the PCC valve work resulted in three workers receiving unplanned, unmonitored exposures ranging from about 655 millirem to about 1205 millirem.

Reviews of steam generator work during the routine outage and the later repair of the leaking steam generator also identified significant personnel exposure tracking and control problems. Despite these weaknesses, the licensee's overall radiological controls response to the leaking steam generator event was commendable. Good ALARA efforts were implemented and no personnel contaminations, or unmonitored releases or releases in excess of limits occurred.

NRC review identified significant improvement in the As Low As Reasonably Achievable (ALARA) program. A new outage radiological controls plan provided improved planning guidance. Outage tasks received extensive ALARA review. Experienced ALARA personnel provided ALARA oversight. There was management oversight of accrued radiation exposures and efforts to identify performance improvement opportunities. Efforts to reduce exposure were good, but there were high dose rates on piping due to deposited radioactive material. The licensee decontaminated numerous isolated radiation hot spots on piping.

Continued implementation of the RPIP included a radiological controls staff reorganization to enhance management oversight. Also, the dual chemistry and radiation protection responsibilities of radiation protection (RP) technicians were eliminated, allowing increased specialization. Additional staff was hired, including six RP technicians. A Radiological Controls Section Head was selected. Additional technical support positions were created and were being staffed. Long-term contractors and personnel from the Yankee organization assisted on-site with program enhancements. These were significant efforts to enhance RP.

To address events and procedure and policy implementation problems, radiological controls training was enhanced. For example, RP technician training was revised to ensure a clear understanding of their responsibilities, a previous weakness. In addition, all personnel were trained on the operational implications of failed fuel, and special training was provided to radiation workers to correct continuing personnel contamination control problems. These were good initiatives; the results remain to be evaluated.

NRC review found good performance-based audits of on-going outage activities. A qualified individual was hired to audit outage radiation protection activities. Audit findings were resolved in a timely fashion. An extensive data base was used for trending all findings including radiological controls findings. Comprehensive finding reviews and bi-annual evaluations were provided to the Nuclear Safety Oversight and Review Committee and to the President of Maine Yankee. This commendable practice showed effective station and corporate management involvement.

The licensee took immediate, appropriate short-term corrective actions on problems. Also, the licensee recognized that program upgrades continued to be needed and identified specific upgrades consistent with the RPIP. While these upgrades were not initiated, the licensee expects, consistent with the RPIP schedule, to upgrade most of these programs before the next refueling outage. Management support of the upgrade efforts was apparent.

Radioactive Effluent and Environmental Monitoring

The licensee effectively implemented the radioactive gaseous and radioactive liquid effluents control program and the radiological environmental monitoring program. Detailed and well-written procedures resulted in excellent control of these activities. Also, the upgrade of the effluent and process radiation monitoring system (RMS) was an excellent licensee initiative.

Licensee performance during a confirmatory measurements inspection was excellent, with all on-site radioactivity and chemistry standards measurements in agreement and the licensee's laboratory QA/QC program a noted strength.

QA audits of these areas were thorough and of excellent technical depth. Overall, the licensee's performance in these areas was excellent.

Transportation and Solid Radioactive Waste

There were significant efforts to remove radioactive waste from plant areas for either temporary storage or offsite shipment and disposal. The licensee cleaned up backyard areas and removed temporary storage areas at the rear of the station. NRC observations of storage and control found good overall efforts. The licensee completely rewrote the radioactive material handling program to address weaknesses identified by self-assessment.

In addition, to address documentation problems identified during the previous SALP, the licensee purchased comprehensive radwaste transportation software for calculation of waste and transport classifications, and increased supervisory oversight of shipping paperwork.

The licensee's quality assurance of radwaste transportation was a good overall effort. Audits were of appropriate scope and depth (in-plant and vendor) and there was a strong quality control presence in the radwaste processing and transportation areas.

Although no performance problems were identified with actual shipments, the training program appeared to be in need of improvement to assure continued program effectiveness. The technician primarily responsible for direct implementation of the radwaste handling and shipping program received only six hours of training in the past four years.

Staffing levels in the radwaste transportation and handling areas was improved. The key position (shipping coordinator) was filled, technicians were permanently assigned and contractor support was obtained to assist in program enhancement. The staffing improvements indicated good efforts to improve program performance.

Summary

The licensee made notable radiological controls improvements. There was heightened attention and oversight by management. Work planning improved, but continued management attention to RP program implementation and consistent staff performance is needed. ALARA controls improved significantly; additional improvement is anticipated if piping contamination is aggressively reduced. Despite exposure control weaknesses, the QA audit program and licensee self-initiatives in oversight were effective. However, a need for improvement in the implementation and adequacy of the exposure control program as well as more consistent staff performance continued to be indicated. Programs for control of radiological effluents and environmental monitoring were excellent, as were initiatives to upgrade the process radiological monitoring system. Transportation and solid radwaste were good, with additional training needs identified.

III.B.2. **Performance Rating**: Category 2

III.B.3. **Recommendations**

Licensee: Continue RPIP implementation. Ensure that the schedule provides for upgrade of external and internal exposure control programs as needed to support outage work. Revise the schedule if necessary.

III.C. **Maintenance/Surveillance**

III.C.1. **Analysis**

In the previous SALP, this area was rated Category 1. Maintenance and surveillance were well-coordinated and controlled, with minimal impact on operation. Management was dedicated to a strong maintenance program. Some weaknesses were identified, but a dedicated staff with competent supervision was a major strength, and a low turnover rate and well-established training program generally resulted in high quality work.

During this period, no forced shutdowns, plant trips, or Engineered Safety Feature (ESF) actuations resulted from maintenance. Safety conservatism was evident in the reduction to 10% power to isolate Feedwater Regulating Valve FW-F-207 to replace the packing, and in the plant shutdowns for generator seal ring replacement and main turbine lube oil pressure decay evaluation. In the latter two instances, the plant was conservatively shut down to investigate whether unexplained symptoms involved equipment degradation. Resolution of technical issues was usually timely. An example was the installation of spare Control Element Drive Mechanism (CEDM) power supplies as a result of previous dropped rods due to power supply failures.

Maintenance was generally well-controlled. The repair of Letdown Isolation Valve LD-M-2 and Steam Generator SG-1 tube leak activities were examples. During the repair of Main Steam Non-Return Bypass Valve MS-70, however, normal procedural controls were bypassed due to a perceived urgency to keep the plant on-line. The repair required maintenance personnel to cut the yoke off from a manual valve which could not be isolated from the main steam line. Because the valve stem had separated from the plug, the yoke and valve stem were forcibly ejected into a wall about fifteen feet from the valve. There were no injuries, but a small unisolable main steam leak was created through the valve body. Maintenance personnel skillfully capped the leak, and the plant was shut down to repair MS-70. Subsequent detailed Maine Yankee self-assessment identified programmatic weaknesses including the failure to adhere to the procedure for control of equipment tagging. Self-assessment also identified procedures, procedure adherence, and the process for control of maintenance as needing improvement. With corporate management support, plant management undertook to redefine the basic purpose and philosophy of procedures, initiate a program to improve procedure quality, and emphasize procedure adherence.

Maine Yankee's commitment to quality maintenance was apparent in the permanent establishment of an outage planning group which provided detailed planning, assignment of priorities, and coordination of maintenance activities. This group proved particularly effective during several unplanned outages late in the SALP period. A new maintenance manager and supervisors provided fresh insight and vigor in the maintenance organization, while making the experience and insight of the previous maintenance managers available in other disciplines. Efforts to upgrade maintenance also included development of a Maintenance Quality Improvement Program, implementation of Maintenance Department Standards of Excellence and improved trending of rework. An automated work control system was scheduled for full implementation in April 1991. Low turnover, highly qualified maintenance personnel, and an effective training program continued to contribute to high equipment reliability. Good staffing resulted in relatively little routine use of overtime.

Management involvement was evident in the well controlled and timely manner in which the NRC maintenance team inspection findings were addressed and resolved by the licensee. Management was fully dedicated to a strong maintenance program and allocated resources to support their program goals. Program controls were in place to evaluate the maintenance program in such areas as work backlog, open work orders, and re-work. The backlog of work was reviewed on a daily basis at morning meetings and closely managed.

Only one missed surveillance was detected, and that was licensee-identified. Maine Yankee took prompt corrective action to address a self-identified problem concerning a mispositioned RPS switch and an NRC-identified problem with testing of the emergency diesel-generators for their capability to accept expected reactive load.

Routine surveillances generally were well-controlled and major surveillances, such as eddy current inspection of the steam generator during the refueling outage, received careful oversight. Overall, the In-Service Inspection program (ISI) was well defined and controlled by the licensee. Innovative examination techniques and evaluation for eddy current testing of steam generator tubes were a notable strength. However, during the December 1990 shutdown following a steam generator tube leak, Maine Yankee's initial failure to expand eddy current testing of the steam blanket region into another steam generator indicated a weakness in ISI program implementation. Subsequently, significant engineering, maintenance, and inspection effort was expended to assure that all cracked and pitted steam generator tubes were identified and removed from service. In addition, a sound response to technical issues was demonstrated by the thorough root cause analysis of a shorted CEDM power supply revealed during a surveillance in January 1990.

Personnel conducting surveillances were typically knowledgeable, careful, and conscientious. Some turnover of personnel in the Instrumentation and Controls organization was promptly addressed by management. No associated adverse impact on surveillance was found.

In summary, the maintenance and surveillance programs were effective, resulting in no plant trips and two Engineered Safety Feature actuations. Management emphasis on increasing plant reliability through effective maintenance was evident in allocation of increased resources for management, planning, and management tools such as automated work requests and a procedure upgrade program. Maintenance was well-controlled and corrective actions were based on thorough self-assessment.

III.C.2 **Performance Rating**: Category 1

III.D. Emergency Preparedness

III.D.1 Analysis

During the previous SALP, Emergency Preparedness (EP) was rated Category 2, improving. That assessment was based upon demonstration of a good emergency response capability as well as a technically sound and thorough improvements to the alert and notification system. Problems were noted regarding staffing for EP program functions and some Emergency Response Organization (ERO) staff members were not fully trained.

During this period, management involvement and control of EP were very good. Senior management was formally and informally kept apprised of EP activities. Managers reviewed and approved revisions to the Emergency Plan and Emergency Plan Implementing

Procedures, maintained qualifications for emergency response positions and participated in emergency drills and exercises. The Maine Yankee President reviewed all internal NRC and Federal Emergency Management Agency (FEMA) recommendations and approved responses. In addition, the licensee developed and implemented a program to correct problems, and generally upgraded the emergency response program. The improvement program included analyses of the root cause for identified problems.

The licensee demonstrated a sound approach to resolution of technical issues from a safety standpoint. In response to FEMA-identified deficiencies in the offsite alert and notification system, the licensee worked with the State of Maine to completely upgrade this system. Fixed sirens and tone alert radios were installed throughout the emergency planning zone to replace less reliable route alerting. The remaining few route alerting areas are beyond 10 miles from the plant and are designed to be covered within 15 minutes. To resolve this long-standing issue, the licensee has formally submitted their design report for the alert and notification system to FEMA for review and approval.

The Emergency Response Organization (ERO) had sufficient depth to support protracted operations. ERO performance in the Control Room and Technical Support Center in the 1989 partial participation exercise and in the 1990 full participation and remedial exercise was very good. Performance in the Emergency Operating Facility (EOF) during the 1989 exercise was adequate, although an area for improvement was identified regarding the determination and issuance of PARs. During the July 1990 annual EP exercise, exercise weaknesses again were identified in the EOF regarding: (1) lack of adequate command and control; (2) the Emergency Operations Facility staff was unaware of or did not understand some plant conditions; and (3) an inappropriate and delayed Protective Action Recommendation (PAR) was issued to the State. In a remedial exercise in October 1990, these weaknesses were shown to be corrected.

ERO training was the responsibility of the Training Department. The training policies and procedures for emergency preparedness were well defined. Training consisted of both classroom and hands-on training. Training problems were noted in the last SALP regarding basic responsibilities and performing required tasks. In response to these problems, Maine Yankee conducted remedial training for the above mentioned EOF weaknesses, which were attributed to training; this remedial training proved effective as evident during the October 1990 exercise. The licensee also utilized their control room simulator for operator training and during exercises. That training was very effective as evidenced by the strong performance of the operations staff during exercises.

The licensee responded to one operational event. Incorrect positioning of a reactor coolant pump seal return filter valve diverted about 50 gallons per minute (gpm) of the reactor coolant pump seals return flow to the Atmospheric Drain Tank instead of to the Volume Control Tank. Operators did not classify this event until a more accurate measurement, using leakage indication specified in the classification procedure, was obtained. Since estimated leakage clearly exceeded the 10 gpm emergency action level, a more aggressive response could have characterized this event sooner. Timeliness of classification was nonetheless assessed as adequate in this case and, when the event was identified, an Unusual Event was

properly declared. Subsequent emergency plan implementation and offsite notifications were correct and timely. The cause of the event was quickly identified and the source of the leak isolated. The Unusual Event lasted only about five minutes.

The Emergency Preparedness Program was well maintained by the Section Head, Emergency Preparedness and Environmental Engineering, who was responsible for all offsite and onsite activities. He was assisted by two Emergency Preparedness Coordinators (onsite and offsite) and by a dedicated position in the Training Department. This staff was sufficient; additional support was provided by various plant staff and by the Yankee Atomic Service Division.

The licensee continued to work closely with the State of Maine and local communities. One staff member was dedicated to offsite planning. That individual, and many management representatives, attended numerous meetings with the State and with local communities. The licensee worked closely with the State to upgrade the alert and notification system. Offsite training conducted by the licensee included both State and local responders. The licensee also conducted required annual training on Emergency Action Levels.

In summary, the licensee maintained a good emergency response capability. Management was involved in maintaining the program, participating in the program, and interfacing with offsite agencies. Training was effective for control room and technical support center staffs. However, EOF staff performance weaknesses were noted in two consecutive exercises, and the weakness in the second exercise were significant enough for imposition for a remedial exercise. Staffing of the emergency preparedness program and the ERO was good. Coordination with the State of Maine and local communities continued to be a strength.

III.D.2 **Performance Rating**: Category 2

III.E. Security

III.E.1 Analysis

During the previous SALP, performance was rated as Category 2. There was a reduction in program effectiveness during the first third of the period. Escalated enforcement action midway through the period was followed by a significant increase in management attention and involvement. There was a subsequent sizeable expenditure of capital resources and a great deal of work by licensee management and staff to improve the program.

During this SALP period, essentially all of the initiatives undertaken in the previous period were continued and aggressive management attention was maintained. Improvements in all aspects of the program continued. Notable improvements were effected in protected area lighting, intrusion detection, assessment and response capabilities, and access control. In addition, weaknesses identified in the previous SALP were promptly and effectively addressed as discussed in the following paragraphs. This was evidence of the licensee's renewed commitment to improved security effectiveness.

Continued active plant and corporate management involvement was shown. Plant management involvement was particularly apparent in discussions of security issues during daily plant status and refueling meetings, by strongly emphasizing to plant personnel their responsibilities toward security, by more active participation in contingency drills, and by increased maintenance support. Corporate management involvement was evident in the continuation of weekly meetings with the security supervisor and the security contractor, in continued attendance at on-site monthly managers' meetings, in support and assistance in the preparation of improvements, upgrades, and program plan revisions, and during quarterly program status briefings with the NRC. In addition, both corporate and plant security management remained active in nuclear plant security organizations. This involvement was further evidence of the licensee's commitment to an effective program.

During this period, the previous Administrative Support Supervisor was promoted to plant Security Director. Throughout the period, the licensee continued to afford him ample training and experience in nuclear security through attendance at pertinent courses, workshops, meetings and visits to other nuclear power plants. Such training and experience, in addition to his former extensive law enforcement experience, enabled him to carry out his duties and responsibilities competently. The Security Director was assisted by the Security Operations Supervisor, who has many years of experience at the plant, and by a recently hired individual who has nuclear plant security experience. Overall, these measures showed licensee recognition of the importance of adequate staffing and program overview. The NRC concern raised during the last assessment period over security managements' lack of nuclear experience was significantly reduced. However, the licensee's efforts to broaden security management expertise should be continued.

The licensee made significant progress in changing from a compliance-oriented to a performance oriented program. Some lingering compliance-oriented indications, apparent early in the period during NRC review of a resubmittal of a security plan revision, were resolved. Evidence of progress toward a performance-oriented program was provided by licensee conduct of three realistic contingency response drills with participation from local law enforcement agencies, by quarterly contingency and vital area response drills at frequencies that exceeded NRC requirements, by use of new tactical philosophies, and by mandating every security force member's participation in an established number of drills. The security force training and qualification plan showed a performance orientation. In addition, six audits of various aspects of security were conducted, utilizing personnel with nuclear security expertise from other plants. These audits pointed out potential weaknesses and program enhancements. Corrective actions on audit findings and recommendations appeared prompt and appropriate.

The NRC's concern regarding the security force's understanding of security requirements was effectively addressed by conducting basic information training, by implementing performance assessment checksheets, by increasing the frequency of contingency drills, by initiating on-the-job training, and by expanding the training and requalification program. Interviews found security force members to be increasingly knowledgeable of their duties and responsibilities and the objectives of the security program.

In addition to the emphasis on improving performance of the security force, revision of training lesson plans was initiated, and the training records and documentation were improved to facilitate requalification. The training staff consisted of four professional and dedicated instructors and one full-time administrative aide. The instructors were very knowledgeable of and qualified in their areas of expertise.

Staffing of the security force was consistent with the need. Overtime was well-controlled and was significantly reduced through the use of contract watch personnel for the more routine tasks. Security force members demonstrated a professional demeanor and significantly improved morale. This accompanied the reduction in overtime, improved communications within the contract security organization and between licensee and contractor management, an increase in wages and benefits, and initiation of several award programs. This was further evidence of the licensee's commitment to an effective program.

On January 1, 1991, the licensee engaged a new security force contractor. The change primarily affected contractor management and resulted in very little turnover in the security force. The transition between contractors occurred very smoothly and with no observed degradation of security effectiveness. This indicated that the licensee's prior planning and coordination were thorough and well-implemented. The change in contractors also indicated the licensee's interest in further improving program and personnel performance.

Early in the period, a personnel error by a member of the plant staff was not promptly reported to the NRC because of a poor understanding of reporting requirements. Subsequently, a better understanding of the reporting requirements was indicated. Four events requiring prompt reporting were correctly reported. All of these involved personnel error and three were attributed to security personnel. Two events resulted from a degraded security barrier, one from a degraded intrusion detection system (IDS), and the other from an inattentive watch-person. NRC evaluation of the events attributed to the security organization revealed that none were related to training program deficiencies. NRC review of the licensee's quarterly event logs revealed that logged events were being properly documented, and that appropriate trend analyses, and corrective actions, where required, were being performed. This was additional evidence that the licensee had improved its understanding of the NRC's reporting requirements.

Personnel and vehicle access control during the refueling outage was improved. Plant worker shift schedules were staggered to relieve turnover traffic. Modifications to the gate house and additional security personnel were instrumental in controlling access and providing quality searches of incoming packages. Controls, such as temporary lighting and location of trailers moved into the protected area for the outage, were good.

During this period, the licensee implemented a Fitness-for-Duty (FFD) program in response to NRC requirements. Program development and implementation were responsive to the spirit and intent of the NRC's FFD rule. Adequate resources were applied and a very comprehensive and in-depth audit program was in place.

Several potential program weaknesses warrant continued plant and security management attention to prevent further problems. These are: control of vital area barriers; keys; authorization of unescorted access; personnel searches; and protected area barrier assessment capability. Also, lack of attention to detail appeared to be a contributing factor in several prompt reportable and logged events. Plant personnel awareness of and adherence to security requirements needs continuing emphasis.

In summary, extensive and dedicated corporate and plant management attention to security was very evident. This resulted in continued and significant improvement in all aspects of the program. The efforts expended by all personnel responsible for the program were very commendable, as was the support provided. While major program improvements have been realized, there is a need for continued management attention to potential weaknesses, personnel performance and attitude, and plant and security staff understanding of program objectives.

III.E.2 **Performance Rating**: Category 2, Improving

III.F. Engineering and Technical Support

III.F.1 Analysis

This area was previously rated as Category 2. Management involvement in routine plant activities was evident. The NRC considered the management initiatives to improve performance good and noted marked improvement in procurement and dedication of commercial grade items. There were weaknesses in contractor oversight, design basis definitions, direct current (DC) bus reliability assurance, probabilistic risk assessment (PRA) utilization, safety evaluations, and design change implementation.

During this SALP period, corrective actions to improve contractor oversight included the development and implementation of two programs for training and advising engineering personnel in the supervision of contractors. Also, a Design Basis Recovery/Development Program was ongoing, with review of the Instrument Air System completed and review of the Service Water and Component Cooling Systems in progress. To improve DC bus reliability, Engineering was developing a design change package to assure DC backup sources. Training was provided to the Shift Technical Advisors who were using PRA criteria to review maintenance priorities.

The engineering organization was primarily composed of degreed, experienced, and knowledgeable engineers. The Engineering Department had an excellent training program with mandatory as well as management supported elective courses. Management encouraged active roles in industry seminars, owners groups, and technical committees. The staff of the Plant Engineering Department (PED), which was expanded during the SALP period, was adequate. However, the NRC observed a lack of on-site longevity among electrical engineers and weaknesses in the on-site ability to deal with engineering issues resulting in the use of off-site engineering services, at a substantial time delay, to resolve some problems. An

example was use of the off-site Yankee Nuclear Services Division not only to prepare load calculations for the emergency diesel generators (EDGs), but also to interpret Technical Specifications and to answer related NRC questions.

Management initiatives to improve safety and performance were evident in the corporate goals for PED and in the multitude of engineering activities. Examples included the development/upgrading of test programs for motor-operated valves and emergency diesels, installation of new environmentally qualified electrical penetrations, completion of loop accuracy and setpoint calculations, and expanded use of the engineering scheduling system to improve utilization of human resources. These and other initiatives indicated a management commitment to long-term improvements in plant safety and to improved engineering and technical support performance. Strong engineering management performance was also evident in the thorough follow-up of a generic low voltage circuit breaker problem.

Good communications between PED and other site organizations were promoted through active PED participation in the Morning Managers Meetings, where technical and operational concerns were routinely addressed. Also, the control of engineering workload and schedules was considered good. Benefits from the Morning Managers Meetings and from planning were evident in the meeting of schedules and goals. Good engineering and technical support were also noted in the Outage Planning and Integration Team's successful identification and resolution of schedule interferences.

Plant modification packages were well organized, complete, accomplished in accordance with procedures, and generally well-done. Improvements occurred in the backlog of temporary modifications. Associated safety evaluations were descriptive and supported the conclusions. Effective engineering and technical support was evident in: (1) careful evaluation and treatment of a low voltage circuit breaker safety concern which resulted in a report under 10 CFR 21; (2) conservative action to identify and address primary to secondary steam generator leakage; (3) the conservative decisions made in the evaluation and repair of the thermal shield positioning pins; and (4) the generally strong technical support of daily plant activities and outage-related projects.

Weaknesses in engineering and technical support activities were also identified. Two failures of environmentally qualified limit switches, in February and October, 1990, and an Engineered Safeguards Feature light box design deficiency identified in October 1990, indicated weakness in Maine Yankee's review and implementation of Regulatory Guide 1.97. In response, Maine Yankee undertook an extensive audit of Regulatory Guide 1.97 implementation to insure no other requirements were overlooked. Additional examples of weakness included: (1) incomplete review of Bulletin 88-04, Potential Safety Related Pump Loss, which later resulted in a commitment to revise the response to the bulletin; and (2) the response to the Station Blackout Rule which, while technically adequate, used some incorrect bases.

Shutdowns related to Engineering/Technical Support inadequacies were due to:

- Failure to change procedural acceptance criteria when a valve's required stroke time was changed.

- Turbine-Generator Electro-Hydraulic Control (EHC) power supply failure due to the modified supply having too high a voltage.

- High closure forces causing a letdown isolation valve to wedge itself shut.

- Slow identification of the uninstallable design for the environmentally qualified containment isolation valve limit switches, the failure of which had potential generic implications.

- Erratic EHC control system operation, involving EHC system interaction with the new main turbine.

- Steam Generator (SG) tube leak repair involving prior failure to address the known phenomenon of steam blanketing of SG tubes.

During preparation for power operation after the 1990 refueling outage, a Maine Yankee control element assembly (CEA) could not be fully inserted into the core. The immediate corrective actions were aggressive, as were the efforts that determined the CEA was mechanically stuck. Maine Yankee undertook a thorough review of the event, performed extensive non-destructive tests to gain a complete picture of the problem, worked with the vendor (Combustion Engineering) to establish a root-cause, and defined the generic implications for other Combustion Engineering licensees. Maine Yankee then distributed their results and findings to other utilities via the Nuclear Network, and presented a summary report to the NRC. In contrast to this instance of excellent performance, incomplete review of the at-power repair of a bypass valve in the main steam system, MS-70, resulted in the ejection of the valve stem and in a small, unisolable steam leak. This was an instance of weakness in safety evaluation of planned activities.

In summary, the performance of the Maine Yankee engineering staff was good. Actions taken in response to the weaknesses identified in the previous SALP report were generally positive, as were the planning and the assignment of priorities. The approach to technical issues was usually sound and routinely exhibited safety conservatism. Decisions involving safety were generally made with adequate review, and corporate management was frequently involved. Engineering evaluations and technical data in support of amendment requests were consistently adequate. However, several instances of lack of attention to detail in design and safety evaluation activities were noted (e.g., MS-70, EQ limit switches).

III.F.2 **Performance Rating**: Category 2

III.G. **Safety Assessment/Quality Verification**

III.G.1 **Analysis**

This area was previously rated as Category 2. Strengths included: a proactive management philosophy in seeking out and correcting substandard or unusual plant performance; timely analysis of events; and engineering and technical analyses. Licensee-initiated licensing

submittals were of high quality with organization, technical content and thoroughness being key attributes. In contrast, the response to two NRC requests for information were noted as untimely, and weaknesses in emergency preparedness and physical security were identified as worthy of management attention.

During this period, senior Maine Yankee operations managers displayed a conscientious safety perspective. The senior plant staff was reorganized and a permanent outage planning group was created. Such changes resulted in improved management controls and fresh insights into performance. Individual thought and pride in Maine Yankee's performance were encouraged. There was continued and aggressive self-assessment, and an obvious motivation for attaining better performance and reliability. For example, the plant's quality assurance surveillance program identified a weakness in the Chemistry Department's program for analyzing diesel fuel oil. Specifically, compliance with recommendations for testing diesel oil flash point, octane number, distillation temperature, sulphur content, and ash and cloud point values was not demonstrated. The licensee took immediate action to follow the recommendations. Newly received fuel oil and oil stored in tanks on-site were then tested as recommended.

Maine Yankee applied for and received two Temporary Waivers of Compliance (TWOCs). In the first, the licensee sought a temporary waiver of the Technical Specification limit on the time allowed to reduce power. The request was made so that power could be reduced more slowly to minimize the impact on leaking fuel elements and to reduce the radiation fields near the primary system. This was a commendable licensee initiative. However, in the other TWOC application, Maine Yankee had been aware of a problem with their startup and shutdown feedwater line-up for several months prior to pursuing a waiver. The delay resulted in an unnecessarily time-critical licensing evolution.

The daily morning managers meeting and the Plant Operations Review Committee (PORC) continued to demonstrate a conservative safety perspective and critical self-assessment, without rigid structure and formality. Discussions were candid, broad and notably directed toward surfacing and solving issues. The decision to shut the plant down to replace the containment isolation valve limit switches was a positive example of safety conservatism being demonstrated by managers at the morning meeting.

Another example of a safety-driven management initiative was the Outage Planning and Integration Team (OPIT). The OPIT, established for use during the 1990 refueling outage, improved coordination among plant departments. In addition, Maine Yankee assigned a dedicated Quality Assurance staff member to perform a daily independent review of radiological controls during refueling outages. This was useful for timely identification and resolution of radiological problems.

Analysis of events and routine operations issues was timely. Generally, effective action was taken to address problems identified. However, review of the licensee's analysis of NRC Bulletin 88-04, "Potential Safety-Related Pump Loss," found no comparison of periodic pump test data to original, baseline data. Appropriate engineering actions were taken to address this NRC concern.

In December 1990, vigilance of the Chemistry staff provided early indication of an evolving steam generator tube leak and prompted timely and conservative action. Early identification by the Chemistry staff, and the Operations staff decision to initiate a plant shutdown before Technical Specification limits were approached, contributed to minimizing the potential consequences of the leak. These timely and conservative actions were specifically commended by the NRC Regional Administrator in his January 22,1991 letter to Maine Yankee.

Although Maine Yankee did not have a reactor trip during this period, there were eleven plant shutdowns. Two of these were voluntary and indicated a conservative approach to operations, but four were due to long-standing design deficiencies and four others were due to design-related equipment problems. Collectively, the design-related shutdowns indicate a need to improve design control based on operating experience.

In one case, administrative controls over maintenance on energized equipment without using the administrative tagging system were overlooked during the unsuccessful on-line repair of Main Steam Isolation Valve Bypass Valve MS-70. In this case, an apparent plant staff focus on keeping the plant on-line preceded an inadequate safety review which allowed an on-line repair attempt without due consideration of the potential consequences. To address this specific weakness, Maine Yankee plant manager review and signature were required before any further work without use of the administrative tagging system of control. In addition, a special investigation of the human performance aspects of the MS-70 event was conducted. Changes to the administrative tagging and discrepancy reporting procedures were recommended to ensure that activities performed without normal tagging controls receive appropriate compensatory review. The management response to the unsuccessful repair was timely and thorough, but this repair effort revealed the continuing need to address previous NRC identified weaknesses in the control of safety-related activities.

With the exception of the RAS actuation, required reports were promptly made. Information reported was usually complete and accurate. Post-event reviews commonly identified realistic root causes and effective corrective actions. Licensee Event Reports (LERs) submitted to the NRC by Maine Yankee were good. However, LER writeups, though adequate, did not always reflect the full scope of the review needed to determine the root cause, or the consideration needed to establish effective actions to prevent recurrence.

In summary, plant management fostered a conscientious safety perspective. Continued performance initiatives demonstrated improved control of activities. Both corporate and plant management continued to demonstrate the ability to be self-critical in seeking performance improvements. Corporate management was frequently and effectively involved in significant events. Excellence was demonstrated in response to a steam generator tube failure. However, weaknesses in the control of certain activities as well as the number of operational difficulties indicate increased management attention is warranted in these areas.

III.G.2 **Performance Rating**: Category 2

SUPPORTING DATA AND SUMMARIES

A. SALP Evaluation Criteria

The following criteria were used, as applicable, to assess each functional area:

1. Assurance of quality, including management involvement and control.

2. Approach to the resolution of technical issues from a safety standpoint.

3. Enforcement history.

4. Event responses, analyses, reporting, and corrective actions).

5. Staffing (including management).

6. Effectiveness of training and qualification programs.

Each nuclear safety and/or safeguards area was rated as one of the following.

Category 1. Licensee management attention and involvement resulted in superior performance. The NRC will consider reduced levels of discretionary inspection.

Category 2. Licensee management attention and involvement resulted in good performance. The NRC will consider maintaining normal levels of discretionary inspection.

Category 3. Licensee management attention or involvement resulted in acceptable performance. Performance at this level is a concern to the NRC because a decrease in performance will approach or reach an unacceptable level. The NRC will consider increased levels of discretionary inspection. (If the NRC were to conclude that there was not an adequate level of safety performance, prompt and appropriate action would be taken separately from, and on a more urgent schedule than, the SALP process.)

Category N. Insufficient information exists to assess licensee performance. Examples include insufficient licensee activity and insufficient NRC inspection.

The SALP Board may assess a performance trend, if appropriate. The trends are:

Improving: Licensee performance was determined to be improving during the assessment period.

Declining: Licensee performance was determined to be declining during the assessment period and the licensee had not taken meaningful steps to address this pattern.

Normally, trends are assigned when the Board believes a change in performance category is likely in the near future.

B. **Background**

Licensee Activities

During this period, there were no plant trips. There was a refueling outage (4/7 - 6/28/90). Other shutdowns occurred for the following reasons:

- To replace reactor coolant pump seals.
- To test a secondary component cooling water isolation valve.
- To repair the electro-hydraulic control power supplies.
- To replace suspect main generator exciter oil seal rings.
- To replace a letdown system isolation valve.
- To replace suspect turbine-generator main lube oil pump seal rings.
- To replace environmentally qualified limit switches after one failed.
- To repair the electro-hydraulic control system.
- To evaluate and repair a steam generator tube leak.
- To replace a main steam bypass valve after ejection of its valve stem.
- To cap a leaking in-core instrument tube.

There were significant power reductions for the following reasons:

- To isolate a main feedwater regulating valve for packing replacement.
- To isolate and repair a feedwater heater steam leak.
- To take the generator off-line to replace electro-hydraulic control power supplies.
- To take the generator off-line to correct erratic turbine valve control.

On August 14, 1990, an Unusual Event was declared when incorrect positioning of a reactor coolant pump seal water return valve caused an about 50 gallons per minute decrease in Reactor Coolant System inventory. The Unusual Event lasted about five minutes.

NRC Inspection and Review Activities

Two NRC resident inspectors were assigned for most of the assessment period. NRC team inspections were as follows:

-- Procurement Team Inspection (89-82), August 7-11, 1989. (Listed in this report due to report issuance in May of 1990.)

-- Safety System Functional Inspection Follow-up (90-80), January 14-19, 1990.

-- Operator Licensing Requalification Program Inspection (90-01), March 12-16, 1990.

-- Regulatory Guide 1.97 Inspection (90-15), July 9-13, 1990

-- Emergency Preparedness Exercise (90-14), July 30 through August 3, 1990.

-- Fitness-For-Duty Inspection (90-18), August 20-23, 1990.

-- Maintenance Team Inspection Followup (90-20), September 24-27, 1990.

-- Bulletin 88-04, "Safety Related Pump Loss" Inspection (90-23), November 5-9, 1990.

C. **Reactor Trips/Unplanned Shutdowns**

C.1 **Reactor Trips**: None.

C.2 **Unplanned Shutdowns**

	Date	Power Level	Root Cause	Functional Area
1.	11/7/89	100%	Design Deficiency	None

Description: Reactor Coolant Pump Seal Failure (high leakage). A service-related failure. Improved design seals were installed.

2.	1/15/90	100%	Inadequate Procedure	Engineering/Technical Support

Description: Secondary Component Cooling Valve SCC-A-460 Stroke Time Testing did not assure compliance with revised criteria.

3.	7/2/90	20%	Inadequate Design Change	Engineering/Technical Support

Description: Electro-Hydraulic Control (EHC) Power Supply Failure due to voltage of modified design being too high.

4. 7/31/90 100% Unknown Operations
Description: Main Exciter Oil Seal Ring. Conservative shutdown to check for problem; none was found.

5. 8/16/90 100% Inadequate Design Engineering/Technical Support
Description: Valve LD-M-2 wedged itself shut because of high closure forces.

6. 9/30/90 100% Sensing Line Failure None
Description: Faulty Main Turbine Lube Oil Discharge Pressure Gauge Indication. The shutdown was a conservative response to low lube oil indication.

7. 10/19/90 100% Design Deficiency Engineering/Technical Support
Description: Environmentally Qualified Limit Switch Replacement of switches which could not practicably be installed and sealed as specified.

8. 11/25/90 90% Design Deficiency Engineering/Technical Support
Description: Electro-Hydraulic Control Valve Control Erratic (associated with the EHC system's interaction with new main turbine).

9. 12/17/90 100% Unrecognized Tube Failure Phenomenon (design) Engineering/Technical Support
Description: Steam Generator Tube Leak due to cracking in U-tube area as a result of steam blanketing, a known problem which was not anticipated at Maine Yankee. Corrected by tube plugging.

10. 1/9/91 20% Inadequate Pre-Evolution Review Maintenance
Description: Main Steam Non-Return Bypass Valve MS-70 Replacement after ejection of valve stem. This was a service-related valve failure due to unsuitability of the original design, with the main problem in this instance being an attempt to repair the valve at power.

11. 2/14/91 100% Unknown N/A
Description: In-core Instrument Tube Leak. Failure cause indeterminate until examined during plant outage. Based on similar problems elsewhere, this was probably caused by in-service stresses due to a design inadequacy.

D. **Enforcement Action**

There was no escalated enforcement. Enforcement actions are tabulated below:

FUNCTIONAL AREA	V	IV	TOTAL
Plant Operations	-	2	2
Radiological Controls	-	5	5
Maintenance/Surveillance	-	1	1
Emergency Preparedness	-	-	-
Security	-	2	2
Engineering/Technical Support	-	3	3
Safety Assessment/ Quality Verification	-	1	1

Total: 14

E. **Licensee Event Reports (LERs)**

Overall, LER quality was good. LERs were brief and to the point, but appropriate information was occasionally left out of the LERs. As a result, LERs did not always reflect the depth of Maine Yankee's assessment. Only one of the 14 LERs referenced a previous occurrence, indicating effective correction of root causes. However, the specific cause was implied rather than directly stated in many LERs. LERs 89-06 and 90-09 did not state when the design deficiencies occurred. LER 90-04 could have included a more substantial safety review with some discussion concerning shutdown margin.

E.2 **Licensee Event Report Table (89-006,90-001 to 90-012, 91-001)**

		CAUSE CODE *						
	AREA	A	B	C	D	E	X	TOTAL
1.	Plant Operations	1	1	-	1	-	-	3
2.	Radiological Controls	-	-	-	-	-	-	0
3.	Maintenance/Surveillance	1	-	-	2	-	-	3
4.	Emergency Preparedness	-	-	-	-	-	-	-
5.	Security and Safeguards	-	-	-	-	-	-	-
6.	Engineering/ Technical Support	-	7	-	-	1	-	8
7.	Safety Assessment/ Quality Verification	-	-	-	-	-	-	-
	Totals:							14

* Cause Codes:

A. Personal error
B. Design, manufacturing or installation
C. Unknown or external cause
D. Procedure inadequacy
E. Component failure
X. Other