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Facility Name: Millstone Nuclear Power Station, Units 1, 2, and 3

Inspection At: Waterford, Connecticut

Inspection Conducted: May 30 to June 16 and July 10 to 14, 1989

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Inspection Summary: A special announced maintenance team inspection was performed at the Millstone Nuclear Power Station, Units 1, 2 and 3, from May 30 to June 16 and July 10 to 14, 1989 (50-245/89-80, 50-336/89-80 and 50-423/89-80).

Areas Inspected: An in-depth team inspection of the Millstone Nuclear Power Station, Units 1, 2 and 3 maintenance program and its implementation was performed. The inspection included a review of maintenance documents and observations of maintenance work in progress. The inspectors used the NRC Maintenance Inspection Guidance, dated September 1988, and Temporary Instruction 2515/97, dated November 3, 1988.

Results: Overall, the maintenance program for Millstone Nuclear Power Station, Units 1, 2 and 3, was functioning well. Areas of strengths and minor weaknesses were identified and are discussed in the Executive Summary and in detail in this report. Appendix 1 to this report provides a list of the documents reviewed by the team, and Appendix 2 lists the attendees at various meetings. Appendix 3 presents a listing of weaknesses with cross references to the applicable sections of the report.

No unresolved items or violations were identified.

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EXECUTIVE SUMMARY

Background

The Nuclear Regulatory Commission (NRC) considers effective maintenance of equipment and components a major aspect of ensuring safe nuclear plant operations and has made this objective one of its highest priorities. On March 23, 1988, the Commission issued a policy statement that states, "It is the objective of the Commission that all components, systems, and structures of nuclear power plants be maintained so that plant equipment will perform its intended function when required. To accomplish this objective, each licensee should develop and implement a maintenance program which provides for the periodic evaluation and prompt repair of plant components, systems, and structures to ensure their availability."

To ensure effective implementation of the Commission's maintenance policy, the NRC staff is undertaking a major program to inspect and evaluate the effectiveness of licensee maintenance activities. This inspection was one of the inspections being performed by the NRC to evaluate the effectiveness of maintenance activities at licensed power reactors. The inspection was conducted in accordance with the guidance provided in NRC Temporary Instruction 2515/97 dated November 3, 1988, and the NRC Maintenance Inspection Guidance, Vols. 1 and 2, dated September 1988. The temporary instruction includes a "maintenance inspection tree" that identifies for inspection the major elements associated with effective maintenance.

Scope of Inspection

The inspection team evaluated three major areas: (1) overall plant performance as affected by maintenance, (2) management support of maintenance, and (3) maintenance implementation. Under each of these major areas, elements considered important for proper functioning of the area were inspected. For each element, the inspectors evaluated both the program and how effectively the program was implemented.

The maintenance inspection at the Millstone Nuclear Power Station was initiated with a site meeting on May 8-11, 1989, where the scope of the inspection, including the maintenance inspection tree, was discussed with licensee management. A list of requested site-specific information had been provided previously to the licensee by letter dated April 13, 1989. A comprehensive preinspection submittal of information based on this request was provided to the team leader by the Northeast Nuclear Energy Company for Millstone Nuclear Power Station, Units 1, 2, and 3.

The NRC inspection team spent May 15 to 26, 1989, at the NRC office preparing for the inspection and examining the information submitted by the licensee. The team conducted an onsite inspection at the Millstone Nuclear Power Station from May 30 to June 16. The team leader conducted an onsite open item closeout inspection from July 10 to 14, 1989.

Unit 3 was in a planned refueling outage during the course of the inspection. Unit 1 went into an unplanned outage to repair a recirculation pump seal and a relief valve during the first week of the inspection. Unit 2 was operating at power throughout the inspection. The major team performance-oriented effort was focused on Unit 3 activities because of the large amount of outage work that was in progress while the team was on site. The team observed work in progress in Units 1 and 2. Specific emphasis was placed on maintenance work during the Unit 1 unplanned outage during the week of May 30, 1989.

The inspection was directed toward observation of maintenance work in progress at the site and licensee activities supporting this work, including engineering, training, and management. Maintenance activities selected for detailed review included equipment identified by the application of the Probabilistic Safety Study (i.e., probabilistic risk assessment (PRA)) as having the potential for contributing significantly to core damage accident sequences or to the reduction of the risk associated with plant operation. Other components and maintenance activities were selected for inspection on the basis of the scope of work in progress during the inspection, recent failures of safety-related equipment, special-interest items, and NRC inspection experience.

A presentation of the Millstone maintenance program was provided to the team by the licensee on May 30, 1989. The following items were discussed during the presentation:

- licensee's organization
- maintenance philosophy
- design control and backfit
- quality services
- training
- production maintenance management system

Daily meetings were held by the NRC team leader with plant management to summarize the inspection team findings and to identify areas where additional information was required. Team members also apprised the maintenance staff of their findings daily. On June 8 and June 15, 1989, communication sessions were held with cognizant licensee management for Unit 3 and Units 1 and 2, respectively, so that each NRC inspector could present significant findings to licensee management.

The summary of the inspection team findings, including a presentation of an evaluated maintenance inspection tree, was discussed during exit meetings with licensee representatives from the management, supervisory, and engineering staff at onsite meetings on June 9, 1989, for Unit 3, and June 16, 1989, for Units 1 and 2. A final closeout exit meeting was held on July 14, 1989, following the open item closeout inspection for all three units (see Appendix 2 for attendees).

Results

The inspection results for each of the major areas evaluated are summarized in the following paragraphs, and the weaknesses are listed in Appendix 3.

(1) Overall Plant Performance as Affected by Maintenance

The 1988 performance indicators are better than the industry average, which indicates an effective and well-implemented maintenance program. The capacity factor for Unit 1 in 1988 was 96.4 percent, the highest capacity factor in the world for a boiling water reactor. The capacity factors for Units 2 and 3 were 75.8 percent and 76.5 percent, respectively, as compared with the industry average of 60 percent for pressurized-water reactors. Overall, material condition of all three plants was well maintained.

General, overall plant housekeeping was adequate considering that each unit had a refueling outage in 1989. The team concluded that to further enhance the material and equipment conditions of each unit, greater attention to detail is warranted while management is conducting housekeeping and configuration control walkthrough inspections.

(2) Management Support of Maintenance

Management is strongly committed to improving maintenance activities at Millstone as evidenced by the numerous maintenance improvement initiatives that were instituted. Examples of noteworthy initiatives are the following: self-assessment of maintenance, accrediitation by the Institute of Nuclear Power Operatings of the maintenance training program; and safety system functional inspections (SSFIs) of Units 1 and 2. The self-assessment of maintenance was both thorough and comprehensive. The assessment is considered to be a strength because it was conducted to improve the effectiveness of maintenance.

As evidenced by the maintenance improvement initiatives undertaken by both corporate and plant management, the maintenance program is receiving strong management attention and support to ensure plant systems and components are maintained in proper working order. The established nuclear maintenance policy provides a consistent overall management approach for the conduct of maintenance.

The implemented predictive maintenance program is considered a strength because the predictive techniques are used to improve equipment reliability. The licensee has implemented an aggressive and effective maintenance program to ensure the reliability of components and equipment at Millstone.

The company-wide production maintenance management system (PMMS) is a comprehensive and effective systems approach for managing maintenance activities. This system is considered a strength because it provides an efficient and uniform method of controlling, documenting, and providing information to management about maintenance activities.

The staffing levels within the Unit 1 PMMS maintenance planning group during outages are minimal as evidenced by the excessive overtime worked during outages; however, no adverse impact on maintenance was identified during the inspection.

Technical support of the maintenance process was effective. Both radiological and ALARA controls were appropriately incorporated into the maintenance process. PRA was actively being used for all three units. The engineering staff was providing responsive support for the maintenance process.

(3) Maintenance Implementation

The licensee has implemented a work control program that is functioning well for all units. The team observed that work was appropriately scheduled and performed by qualified maintenance personnel. Radiological and ALARA controls were in place and were being effectively implemented. Meetings involving the planning, coordinating, and scheduling of work were being conducted at all units to ensure communication and effectiveness of the work to be done. Communications and cooperation between work groups were good. The company-wide computerized PMMS for work control, documentation, status, history, and management feedback regarding work status was found to be very effective. The general ease of access to the PMMS for all levels within the organization controlling work was considered a strength in the maintenance process. The licensee's post-maintenance test controls are in place; however, the team concluded that additional improvements in retest controls were needed. Licensee management stated that improvements would be made.

The licensee's maintenance organization in each of the units was found to be functioning well with highly trained and qualified staffs. Training programs and facilities for the maintenance staff were especially noted to be excellent. Backlogs of work orders and rework for all units were small.

The organizations to perform maintenance for each unit were completely separate and independent. Each unit had a maintenance organization that performed mechanical and electrical work and another for instrument and controls (I&C). Outage work for a unit is supported by trained people drawn from other company organizations and supplemented by contractors. Training requirements for people doing outage work were specified by unit management. Status of an individual's training is available from the Training Department.

The unit maintenance organization included its own engineers; this aided the maintenance organization's interaction with both unit and corporate engineering personnel. The maintenance organizations for the units were functioning well.

The maintenance shops and facilities for each unit were separate and independent. Overall, the maintenance facilities at Millstone were a noted strength. The training school's use of similar-type plant equipment, mockups, and sophisticated computer programming provided the maintenance personnel, including contracted personnel, with the latest methods and techniques in learning. The failure trending program used state-of-the-art engineering techniques and has been a strength in predictive maintenance.

The licensee's personnel controls were found to be supportive of the overall maintenance process. Major strengths were noted in a dedicated and interested personnel staff, an impressive training program, and an effective test and qualification program.

The State of Connecticut passed regulations in May 1987 that restricted random and annual drug testing of employees. The licensee withdrew its fitness-for-duty program because of the restrictions on testing in the State law. With the issuance of NRC's 10 CFR Part 26 on June 6, 1989, management is in the process of developing and reinstituting an appropriate fitness-for-duty program to comply with NRC's new regulation. Overall, the licensee's personnel controls were found to be functioning well.

The Maintenance Inspection Tree

The inspection team's conclusions about the status of the plant's maintenance program are indicated by colors (green, yellow, red or blue) on the maintenance inspection tree for each unit. (See Figures 1 for Units 1 and 2, and Figure 2 for Unit 3). For parts II and III of the tree, the upper-left portion indicates how well the topic of the block is described and documented in the plant maintenance program, including adequacy of procedures. The lower-right portion of each block indicates the team's conclusion as to the effectiveness of implementation of the topic covered by that block. Green indicates that the program is well documented or that program implementation is effective. However, even for blocks shaded green, some areas for improvement may be indicated in the report. Yellow indicates adequacy but the element of the program could be strengthened, and Red indicates the topic is missing or the intent of that portion of the tree is not being met by the maintenance activities. Blue indicates the item was not evaluated or could not be properly evaluated because of insufficient data.

The inspection team concluded that maintenance processes that are functioning well have been implemented at Millstone Units, 1, 2, and 3. The significant attributes of the maintenance tree for each unit were found to be well established and implemented. The team identified a number of strengths and a few weaknesses that are discussed in the report. Weaknesses represent potential problems or conditions discussed for licensee evaluation and corrective action as applicable. As weaknesses were identified by the inspection team members, they were presented to licensee representatives for initial review and evaluation during the course of the inspection. Individual weaknesses are discussed in the appropriate areas of the report and are summarized in Appendix 3 of this report. The licensee is encouraged to conduct its own evaluation of maintenance-related activities using the maintenance inspection tree with the objective of finding areas for improvement not identified by the previous self-assessment or this NRC team inspection.

INSPECTION FINDINGS

This report presents the inspection team's findings and conclusions regarding the maintenance process and its implementation for Millstone Nuclear Power Station, Units 1, 2, and 3.

The section numbers of this report do not correspond to the numbering sequence of the maintenance inspection tree (Figures 1 and 2).

1. OVERALL PLANT PERFORMANCE RELATED TO MAINTENANCE (Direct Measures)

The objective of the inspection in this area was to assess overall plant performance as related to maintenance by conducting plant system walkdowns and direct inspections of completed work and maintenance activities in progress. Historical data that included unit availability factors (capacity factors), reliability data such as unplanned reactor trips, and engineering safety feature actuations and radiation exposure were also evaluated to determined the effectiveness of the maintenance process.

The inspection team conducted general plant, as well as, selected system and component walkdown inspections to assess the material condition of each unit and to verify that deficiencies were being properly identified and work orders were initiated on housekeeping or equipment problems.

Findings

Administrative Control Procedure ACP-QA-4.01, "Plant Housekeeping," provides the means to ensure housekeeping, cleanliness, and maintenance deficiencies are identified and corrected. This procedure is further implemented by more detailed unit specific instructions.

During the walkdown inspections of plant systems and maintenance in progress, the team identified approximately 30 deficiencies overall that had not been identified previously through the licensee's deficiency reporting process. Examples of deficiencies by unit are the following:

Unit 1

- Screws were missing on drywell air duct access covers.
- Nitrogen supply line to the "D" inboard main steam isolation valve was hitting a metal flange.
- The intermediate range monitor electrical drive cable sheath was broken inside the drywell.

- Two air deflector supports were broken near the "A" recirculation pump motor.

- The insulation blanket on the suction line to the "B" recirculation pump was hanging partially unattached.

- The cotter pin on a clevis hanger on isolation condenser piping was not open.

- There was rust on a service water pipe flange adjacent to the drywell air lock.

- Cable tray cover section was left uninstalled.

Unit 2

- There was groundwater inleakage in the "A" charging pump room.

- A cable tray section was missing, leaving the cable unsupported in the "B" charging pump room.

- There was groundwater inleakage in the "A" safeguards room.

- There was rust on service water (SW) piping and supports in the pipe chase.

- The T041 high-voltage cabinet door was open in the emergency diesel generator room.

- Carts and equipment were stored without being secured in the vital switchgear rooms.

- Cable vault trays and room contained trash.

- A penetration seal to the control room appeared to have a piece missing in the cable vault room.

Unit 3

- The outboard motor bearings of both auxiliary feedwater pumps were leaking oil.

- There was rust on chilled water piping, valves, and nuts inside the containment.

- Corrosion was identified on components inside the lower elevation of the containment.

- A cotter pin on a clevis hanger in the auxiliary feedwater pump room at valve 3FWV62 was clipped off.

The deficiencies identified were corrected during the inspection or management action was being taken to resolve the concern. Overall, the material condition of each unit was well maintained, even though the team observed some minor deficiencies. The team did find that the licensee's own walkdown inspections could be improved by ensuring that all areas of the plant receive periodic, detailed, in-depth scrutiny during walkdowns. During the licensee's walkdowns, areas were omitted or attention to detail was lacking.

The team also noted that management performs additional plant walkdown inspections such as injury-prevention walkdown, inspections in accordance with Millstone Administrative Policy MAP 5.20, fire hazard walkdown in accordance with inspections per ACP-QA-2.05; and containment/drywell closeout walkdown inspections.

These management walkdown inspections are tracked by automated work orders on the computer-based production maintenance management system (PMMS). Deficiencies are documented and corrected by the following deficiency-reporting methods: trouble reports, plant incident reports, potential substantial safety hazard reports, nonconformance reports, and licensee event reports. The team reviewed several completed safety observation forms and determined that deficiencies are being identified and corrected by use of the numerous deficiency-reporting systems.

The team observed that maintenance work areas were maintained in a safe and controlled manner with properly designated postings.

The team, while inspecting in-process maintenance activities, witnessed operations personnel generate a deficiency report to describe a previously unreported deficient condition, a sodium hypochlorite leak from a pipe. After the condition was reported as required, the licensee promptly initiated action to correct the problem. The use of the PMMS and trouble reports enables anyone to initiate action to correct deficiencies. Use of this uniform method of identifying and correcting deficiencies is considered a strength.

The team observed the implementation of a new video imaging technique, which produces still photographs of equipment and components in the plant. The Unit 3 Radiation Protection Department is using this technique to record the surveyed radiation levels directly on the photographs. Unit 2 has a new computer-driven CEVUE(tm) system that, for example, permits anyone planning work inside the containment to view on a video monitor the location and equipment to be worked on and to obtain hard-copy pictures. These techniques appear effective in planning work and in reducing radiation exposure rates. They are considered strengths.

The team reviewed the 1988 operational history data for each unit to assess the licensee's performance with respect to availability, operability, and reliability. The items reviewed included capacity factors, unplanned reactor trips, engineered safety feature (ESF) actuations, and radiation exposure. The results were as follows:

- The 1988 capacity factors were:

  - Unit 1: 96.4 percent - the highest capacity factor in the world for a boiling-water reactor (BWR).

  - Unit 2: 75.8 percent - higher than the industry average of 60 percent for a pressurized-water reactor (PWR).

  - Unit 3: 76.5 percent - higher than the industry average of 60 percent for a PWR.

- Units 1 and 2 had one unplanned reactor trip, and Unit 3 had five; none of these was directly related to maintenance.

- Units 1 and 3 each had one ESF actuation, and Unit 2 had three.

- The collective person-rem exposures for 1988 were:

  - Unit 1: 157 person-rem - below the industry average of 700 person-rem for a BWR.

  - Unit 2: 783 person-rem - higher than the industry average of 500 person-rem for a PWR.

  - Unit 3: 92 person-rem - below the industry average of 500 person-rem for a PWR.

Overall, the performance indicators in these areas were better than the industry average, except for the person-rem radiation exposure at Unit 2, which is directly related to problems associated with the steam generators. The licensee intends to replace the steam generators in 1992. The five reactor trips experienced at Unit 3 exceeded the licensee's established goal of three trips. The safety engineering group is developing an improvement plan to reduce the number of inadvertent reactor trips.

Conclusion

The team found that general housekeeping and material condition of each unit on an overall basis were well maintained, considering that Unit 3 was in a refueling outage, Unit 1 had just ended a refueling outage, and Unit 2 had had a refueling outage earlier in 1989. Painting to upgrade the plant appearance and preservation was evident throughout. However, greater management attention to detail is needed while conducting configuration control and plant housekeeping walkdowns to further enhance the material condition of the plant and of the equipment. The team found that, overall, the material condition of the equipment and components was maintained at a level to ensure operability and dependable performance.

The performance indicators for 1988 indicate that the maintenance program is functioning well and was being implemented effectively at each unit, as evident by the following strengths: higher than industry average capacity factors and, in general, lower than industry average person-rem radiation exposure rates with the exception of Unit 2. Unit 2 higher than industry average person-rem radiation exposures is viewed as a weakness.

The team concluded that for Units 1, 2, and 3, the overall plant performance related to maintenance (direct measures) was functioning well.

2. MANAGEMENT SUPPORT OF MAINTENANCE

The objective of this part of the inspection was to assess plant and corporate management support of maintenance activities in the plant with respect to the establishment, implementation, and control of an effective maintenance program. The major areas evaluated by the team were management's commitment to and involvement in the program, its administration of the program, resource and the technical support provided to the maintenance organization. The team evaluated discrete elements within these areas, such as a documented maintenance plan, self-assessment measures, resource allocation, definition of maintenance requirements, and accountability, to provide a basis for its overall assessment.

2.1 Management Commitment and Involvement

The objective of the inspection in this area was to evaluate corporate and plant management's commitment to and involvement in ensuring the adequacy of plant maintenance as indicated by (1) management's interest and participation in the assessment and improvement of the maintenance program and (2) management's support and application of industry initiatives.

The team evaluated these elements through discussions with plant and corporate staff and reviews of the licensee's planned, in-progress, or completed activities associated with the conduct of plant maintenance.

Findings

Management is committed to improving the maintenance program at Millstone as evidenced by the following initiatives implemented in the area of maintenance.

A licensee-conducted self-assessment of maintenance, performed in 1987, resulted in the identification of approximately 60 assessment findings. To resolve these findings, which identified weaknesses and potential problems, management developed a management action plan. The plan addressed each finding with respect to implementation responsibility, improvement action, and milestone planning dates. The process for implementing corrective action to resolve the findings is tracked, and periodic progress reports are sent to plant and corporate management. The team found that the self-assessment was both extensive and aggressive. Resolution of the assessment findings in a timely manner is an indication that management is involved in and supports the improvment of the overall maintenance program. Only four assessment findings, which have no effect on safety, were still open.

The licensee conducted safety system functional inspections (SSFIs) at Unit 1 and Unit 2, which were patterned after the NRC SSFIs. The SSFI at Unit 1 covered the condensate, feedwater, and feedwater coolant injection systems. The SSFI at Unit 2 covered the reactor building closed cooling water system and interfacing support systems such as diesel generators, batteries, and the service water system. Management is actively tracking and resolving the identified issues.

The maintenance training programs for the instrument and controls (I&C), mechanical, electrical, and production test groups were accredited by INPO on December 15, 1987. A centralized nuclear training center, located near the Millstone site, serves all technical disciplines with well-equipped laboratories and classroom facilities. The technical training staff consists of the following instructors: six mechanical, five electrical, four health physics, eight I&C, and four chemistry. The training organization reviews documents on industry operating experience in order to incorporate lessons learned into the maintenance training program so as to prevent similar occurrences and/or improve the quality of maintenance activities.

To improve the effectiveness of training, the following initiatives were implemented:

- In an effort to improve the motor operated valve testing (MOVATS) program, the Training Department introduced an alternate testing program called the valve operator test and evaluation system (VOTES). The VOTES method is supposed to improve analytical ability while reducing radiation exposure. Effectiveness of the VOTES is being evaluated.

- All of the I&C technicians at Unit 2 attended an instrument failure analysis course. The course is intended to make the I&C technicians more aware of the critical role they play at the unit and their relationship to the operator. The course is being expanded to include the I&C technicians at the other units.

- Several of the technical training courses were submitted to the University of the State of New York for college credit assignment. To date, 47 courses have been submitted for a total credit value of 118 semester hours.

- A study was undertaken by the licensee in collaboration with several local universities to evaluate retention of knowledge by the students. The goal of the study is to optimize learning and define actual requalification intervals based on the decay of knowledge and skills.

These training initiatives will help increase the quality of maintenance activities. The maintenance training program is both comprehensive and well supported by management.

Through interviews with plant management, the team determined that licensee personnel have participated in eight maintenance peer evaluations throughout the United States. In addition, approximately 263 individuals participate in various external committees and standards groups, such as the ASME Operations and Maintenance Main Committee/Executive Committee; ASME Working Group OM-13, and the ASME Section XI Maintenance Working Group.

The licensee participates in the nuclear plant reliability data system (NPRDS), which is an industry-wide system for tracking the performance of selected systems and components at nuclear power plants. The NPRDS maintains two types of data on plant systems and components: engineering records and failure reports. The Technical Report Supervisor is responsible for ensuring that NPRDS data reporting requirements are satisfied for each of the licensee's operating nuclear units. The licensee uses an in-house computer program called the baseline reliability data system (BRDS) to record and maintain NPRDS data. The team found that the Nuclear Operations Department has a program and procedure in place to report and maintain NPRDS data.

A licensee evaluation performed during November 1988 by the independent safety engineering group (ISEG) indicated that Unit 3's Maintenance and I&C Departments were not typically using the data contained within the NPRDS data base. ISEG recommended that an introductory training session be provided to the supervisors of the unit Maintenance, I&C, and Engineering Departments explaining the functions and capabilities of NPRDS. The team did not identify any safety concerns because the NPRDS data were not used, however, considered the lack of use by Unit 3 Maintenance and I&C Departments to be a weakness.

Management uses the following feedback methods to judge the positive and negative aspects of the maintenance program: monthly plant performance indicators, plant incident reports, technical training feedback evaluations, self-assessment initiatives, quality assurance audits, and (PMMS) reports. All of this feedback is evaluated, and corrective actions are implemented to improve the maintenance program.

The tracking and reviewing of industry documents, such as NRC information notices, INPO significant event reports, and 10 CFR Part 21 notifications, are controlled by Nuclear Operations Policy NOP-1.06, "Vice President - Nuclear Operations Committee Program," and Millstone Administrative Policy MAP 3.01, "Controlled Routing System." The team reviewed several industry documents to determine the adequacy of the licensee's tracking methods.

Documents are assigned to specific individuals and have a tracking number, priority code, and due date. A list of all outstanding controlled routing items is distributed by the Station Superintendent on a weekly basis. These tracking methods are effectively controlling the technical assessments of industry documents.

Conclusion

Management is strongly committed to improving maintenance activities at Millstone as evidenced by the numerous maintenance improvement initiatives that were initiated. Examples are the self-assessment of maintenance, INPO accreditation of the maintenance training programs, the SSFIs at Unit 1 and 2, and the centralized technical training facility.

Management is supportive of and strongly involved in industry initiatives as demonstrated by the participation in various maintenance peer evaluations and the numerous individuals on code committees and standards groups. The team did not identify any safety concerns with Unit 3's lack of use of NPRDs data however did conclude it to be a weakness in the Unit 3 maintenance process.

The self-assessment of maintenance was both thorough and comprehensive. Also, identified deficiencies and corrective actions were being adequately tracked, and identified deficiencies were being resolved in a timely manner. The maintenance self-assessment is considered a strength in that it assisted in improving the effectiveness of maintenance activities.

On the basis of these improvement initiatives undertaken by both corporate and plant management, the team concluded that the maintenance program is receiving strong management attention and support to ensure that plant systems and components are being maintained in proper working order.

2.2 Management Organization and Administration

The objective of the inspection in this area was to evaluate the effectiveness of the management organization in the administration of the maintenance program. To provide a broader perspective of maintenance processes and to ascertain whether maintenance activities were properly implemented, the team reviewed the following areas: formal maintenance plan; maintenance policy, goals, and objectives; allocation of resources; identification and definition of maintenance requirements; performance measurement; document control system; and maintenance decision process. The team evaluated the areas to provide a basis for its overall assessment and conclusions.

Findings

A nuclear maintenance policy statement, Nuclear Engineering and Operations (NEO) Policy Statement No. 31, "Nuclear Plant Maintenance," was issued on October 6, 1988. This policy statement defines the objectives of, and management's responsibilities in regard to the nuclear plant maintenance program. The Vice President, Nuclear Operations, is responsible for the overall scope and management of the nuclear plant maintenance program.

The policy statement identifies the types of maintenance contained in the maintenance program. Preventive maintenance (PM) is to be a major part of the overall program. Predictive maintenance analysis augments the PM program, and its objective is to improve the availability and reliability of each generating unit. The production maintenance management system (PMMS) is the management system used to control and monitor maintenance activities.

NEO Policy Statement No. 31, does not clearly identify the lines of responsibility for controlling maintenance activities or the person responsible for performing the periodic evaluations of the maintenance program and updating it when necessary. The maintenance program appears to be implemented well, although NEO Policy Statement No. 31 does not provide specific lines of responsibility for conducting the maintenance program.

NEO Policy Statement No. 31 is consistent with the licensee's 1989 corporate objectives, strategies, and goals; that is, to an aggressive high-quality preventive and corrective maintenance program to reduce equipment failure, reduce overall maintenance costs, and increase efficiency of the generating units. The goal is to attain an annual capacity factor of 65 percent for Unit 3 and 3-year average capacity factors of 74 percent each for Units 1 and 2. The licensee also has established a refueling outage planning goal of 35 days, with a 7-day increase in the planned refueling schedule, if necessary. Any increase in planned outage length beyond 42 days requires the approval of the Senior Vice President, Nuclear Engineering and Operations. NEO Policy Statement No. 30, "Nuclear Plant Outage Authority" addresses the refueling outage goal. The team was unable to verify if the NEO policy statements are reviewed and updated periodically, since the two policy statements were just issued in 1988.

The licensee uses the PMMS to plan and allocate the required maintenance personnel needed to perform certain maintenance tasks. PMMS performance reports provide graphical tabulations of future scheduled work for a department and a summary of actual staff hours expended by a task department. This is a useful management tool for forecasting staffing resources required to complete refueling outages within the established goal.

Contract support personnel are used extensively during outages and other high-activity periods. Contract craft support personnel, who are at the licensee's facility less than 6 months, are controlled and supervised by the plant's regular staff. However, contractor support is being reduced because of cost-containment considerations.

The number of maintenance personnel and the average overtime expended at each unit by licensee maintenance personnel during 1988 are as follows:

	Number of Personnel	Average Overtime Hours Per Person-Year
Unit 1	73	196
Unit 2	75	492
Unit 3	94	358

Millstone Administrative Policy MAP 4.04, "Personnel Overtime," addresses overtime control. The procedure requires advance authorization by the Station Superintendent if an exempt employee's overtime is going to be more than 100 hours/month.

Review of the maintenance work order backlog at each unit indicated that the average corrective and preventive work order backlog was approximately 200, excluding Unit 3's scheduled refueling outage work activities. The backlog of work orders was well managed and controlled. This indicates that sufficient resources in staffing, engineering support, and material have been allocated to the maintenance program to maintain a minimal work order backlog and efficient performance.

The team found, however, that the overtime hours worked by the Unit 1 PMMS maintenance planner were excessive during the outage in the spring of 1989. The staffing levels of the maintenance planning support groups varied for each unit. Unit 1 had the least number of personnel within the maintenance planning support groups. This is considered to be a weakness because excessive overtime was used to control maintenance activities instead of the allocation of additional staff resources. Even though the Unit 1 PMMS maintenance planner worked a great deal of overtime, the work orders were still effectively managed.

To ensure the proper implementation of applicable maintenance requirements such as environmental qualification (EQ), preventive maintenance, corrective maintenance, inservice inspection (ISI), and surveillance testing, the licensee has incorporated this information directly into the PMMS data base. Specific requirements are automatically specified and included on the automated work order (AWO), which is issued directly by PMMS. The team verified that appropriate requirements were being properly specified by reviewing in-process use of maintenance AWO packages.

The EQ maintenance activities are implemented through an integrated plant maintenance procedure. Preventive maintenance activities are accomplished using unit-specific procedures in conjunction with PMMS. The Maintenance Department Supervisor or designee is responsible for ensuring that these maintenance requirements are satisfied.

Several predictive maintenance techniques are performed on selected equipment at Millstone. Methods used to monitor and trend the performance of safety and non-safety equipment so that planned maintenance can be performed before equipment failure consist of the following: vibration analysis, infrared analysis, and motor-operated valve testing (MOVATS and VOTES). The reliability engineering group periodically issues performance reports to management to provide performance summaries and make recommendations in regard to improving performance. These predictive maintenance activities are an integral part of an effective overall maintenance program and are viewed as a strength.

Industry documents are reviewed and assessed for application and incorporation into the maintenance program and procedures by use of the controlled routing system discussed in Section 2.1. when determined to be applicable by station management.

Maintenance procedures and nuclear training manuals are reviewed at least once every 2 years. These biennial reviews incorporate all approved interim changes as required by Administrative Control Procedure ACP-QA-1.05, "Site Operations Review Committee."

Root cause analysis of identified maintenance-related failures is performed as required by Administrative Control Procedure ACP-QA-10.12, "Root Cause Assessment Process." The procedure does not clearly identify which group is responsible for conducting root cause evaluations. The procedure specifies that an investigator be selected by either the station or unit superintendents to conduct root cause evaluations and to specify corrective actions to prevent recurrence. Even though the procedure is not definitive with respect to the group responsible for conducting root cause analysis, the team determined that the root cause investigation process was working, as evidenced by the root cause evaluation of the Unit 1 "A" recirculation pump seal failure that was being performed by a Unit 1 maintenance engineer.

Performance monitoring is formally documented in Nuclear Operations Policy NOP-2.10, "Utility Performance Monitoring Program," and is implemented using Millstone Administrative Policy MAP 1.08, "INPO Performance Indicator Quarterly Reports." The Station Superintendent's staff engineer is responsible for collecting the information from department supervisors and submitting a quarterly performance monitoring report to management. The report compares each unit's performance with historical data, industry average data, and corporate goal data. Review of the 1988 quarterly performance monitoring reports showed that the data contained in these reports are useful management tools to improve the reliability of equipment and to increase the effectiveness of maintenance The licensee's feedback methods used to evaluate the effectiveness of maintenance activities are discussed in Section 2.1. Secondary heat exchanger performance has improved as a result of performance monitoring. This type of monitoring indicates the cleanliness of heat exchangers and is then used to optimize preventive maintenance cleaning of the exchangers.

Under the plant reliability program, component operating performance, component integrity, and system design reliability are reviewed. The program consists of the following: monitoring equipment performance to prevent catastrophic failures, determining root cause of failures and making recommendations to prevent recurrence, and evaluating system designs for reliability. Periodic performance reports are issued to plant and corporate management and provide performance summaries and recommendations in regard to improving performance.

While inspecting in-process work activities, the team observed that management oversight of maintenance activities was adequate. Management personnel randomly walked down and reviewed completed maintenance work activities.

The system used to document and control maintenance work activities the computerized production maintenance management system (PMMS), is implemented using Nuclear Operations Department Procedure NOD 3.02, "PMMS Automated Work Order System." The PMMS is a comprehensive company-wide system that uses the licensee's main frame computer for managing maintenance in a planned and systematic fashion. The PMMS is used to

- track preventive maintenance/corrective maintenance work orders
- provide maintenance work order history
- trend information such as work orders, backlog history, and repair times
- indicate rework

- forecast resource needs

These examples are just a few of the types of outputs available from this system. In addition, PMMS is accessible station wide. This system is considered a strength because it enables management to be more effective and efficient in identifying potential weaknesses in the maintenance process.

Maintenance work orders are implemented and controlled by Administrative Control Procedure ACP-QA-2.02C, "Work Orders." The procedure defines responsibilities, documentation requirements, and lines of communication.

The team reviewed several completed work order packages that were maintained in the nuclear plant records facility to verify that the document control system was properly implemented. The team verified that documentation and record retention of completed maintenance work activities was adequate and consistent with procedural requirements.

The team evaluated the management decision process relative to the maintenance area by conducting interviews with plant and corporate management. It also reviewed past and present initiatives to determine management's support of maintenance activities. The licensee intends to replace Unit 2's steam generators in 1992. Certain service water piping is being upgraded at all three units. The emergency core cooling system torus suction strainers were replaced at Unit 1 in 1989 with larger ones. Maintenance shop spaces were recently expanded and upgraded at Units 2 and 3. The instrument air systems at Units 1 and 2 are being upgraded. The licensee has implemented the reliability program to evaluate equipment performance and make recommendations on improving performance. Also, management is evaluating two different motor-operated valve testing techniques (MOVATS and VOTES) to determine which one is more effective.

A new management philosophy is being implemented with respect to when maintenance activities are to be conducted. The new philosophy is to perform more maintenance activities while the units are operating. This is intended to reduce planned outage time. Management is strongly committed to maintaining an effective maintenance program as evidenced by its decisions in regard to maintenance.

Conclusion

The established nuclear maintenance policy provides a consistent overall management approach for the conduct of maintenance. The policy statement lacks definition of lines of responsibility and who periodically reviews and updates the policy.

The implemented predictive maintenance techniques used to monitor and trend equipment performance are considered a strength. These predictive methods have improved equipment reliability and are now an integral part of the effective overall maintenance program.

The comprehensive computerized production maintenance management system (PMMS) is an effective company-wide system for managing maintenance activities. This system is considered to be a strength, in that it provides an efficient and uniform method to control and document maintenance work activities.

The Unit 1 PMMS maintenance planning group manages heavy outage workloads effectively. However, overtime records indicate that excessive overtime was worked by the Unit 1 PMMS planner to accomplish the maintenance planning activities during the outage period. This is considered a weakness, in that excessive overtime instead of the allocation of additional staff resources is being used to control maintenance planning activities.

The performance monitoring reports associated with maintenance activities are a useful trending tool used by management to assess and improve the effectiveness of the maintenance program.

On the basis of the above, the team concluded that the licensee's management has implemented an aggressive and effective maintenance program including initiatives to improve the reliability of components and equipment at Millstone.

2.3 Technical Support

Scope

The objective of the inspection in this area was to evaluate the technical support the maintenance organization receives from others in regard to the maintenance process. The team evaluated internal and corporate communication channels, engineering support, probabilistic risk assessment (PRA), quality control, radiological controls, safety, and the integration of regulatory documents into the maintenance process.

Findings

A station superintendent's meeting is held each morning and provides a forum for disseminating information to all units. Individual unit staff meetings also are held each morning, usually chaired by the unit's superintendent, for the purpose of disseminating unit-specific information and for discussing plans and scheduling specific work. Support needs for the maintenance process are discussed and coordinated during these unit meetings. These meetings were well attended and, as needed, detailed coordination of work and work interfaces were established. During outages, detailed work schedules that list specific work order subtasks are discussed and implementing action plans are formulated across organizational interfaces.

The team inspected specific work orders and assessed the effectiveness of communication. For example, the service water upgrade project was in progress in all three units. The team interviewed maintenance and engineering personnel regarding this project and found that effective technical support from the site to the corporate level was being provided.

Engineering support for the maintenance process is available on site from each unit's engineering organization. The unit maintenance supervisors also have engineers on staff that report directly to them. During its inspection of ongoing work for the service water upgrade program, the team found that communications (including support) between the onsite and corporate engineering staffs was effective.

The company-wide production maintenance management system (PMMS) provides easily accessible information about work orders. PMMS information is available to all management levels from site to corporate (about 1500 authorized users). It is used to manage, control, and disseminate information about maintenance and any specific automated work order (AWO). The PMMS is one of the key management systems that supports the maintenance process, including providing for the management and distribution of information regarding work and work orders.

During the inspection, the team noted the following ongoing engineering-type activities in support of the maintenance process:

- Predictive maintenance analysis - A reliability engineer was observed monitoring main turbine bearing vibration (this is routinely done for all units and includes the actual balancing).

- Failure determination and analysis - During inspection of the Unit 1 defective 1A pump seal, the inspector noted that a plant incident report (PIR) had been submitted by the operations shift supervisor to initiate the root cause failure analysis.

- Establishment of a materials control group - This group has representatives from each unit and the corporate engineering organization for handling material problems with commercial-grade systems. Material problems with critical systems are handled by the corporate engineering organization.

Eleven people are assigned to the corporate probabilistic risk assessment (PRA) group. PRA models were complete for Units 1 and 3 and two-thirds complete for Unit 2. The PRA group supports the plant, including the maintenance process, for example, when specific requests for PRA-based evaluations are made. For example, PRA was used at Unit 1 to optimize main steam isolation valve testing and to perform a gas turbine generator reliability study. PRA was being used at Unit 2 to assist in analyses being made concerning the acceptability the of continued operation with the Unit 2 degraded steam generators. PRA was used to rank Unit 3 motor-operated valves having potential failure mechanisms in the order of their importance to safety. The team found that PRA was being used effectively in support of the maintenance process.

During field inspections of ongoing maintenance and reviews of completed welding AWOs, the team specifically checked to determine if quality control (QC) personnel were actively involved in the maintenance process. The team found that QC hold points were being specified and QC inspector signoffs were being made. The team also determined that authorized nuclear inspector (ANI) inspections were specified and were being conducted for code work. The Quality

Service Department had also initiated a program of performing random surveillances to verify quality functions. Lack of coverage of retests by QC personnel appeared to be a weakness, although some auditing of retests was being done.

The team inspected selected work orders, procedures, and ongoing work to assess the extent radiological and as low as is reasonably achievable (ALARA) controls are integrated into the maintenance process. The team found that both health physics (HP) and ALARA input was strong in the planning stage as well as the implementation stage of work. A proactive management concern for the ALARA principle was evident in planning and scheduling meetings. A person-rem bank-account approach was being used, and the allotment of person-rem for specific work was being closely controlled. Each unit had ALARA coordinators that were involved in work planning. Job-specific training is being used extensively, including the use of mockup facilities at the training center or at the individual units to further minimize radiation exposures. Worker exposure control is further ensured through well-controlled radiation work procedures, dosimetry, surveys, ventilation controls, and frequent coverage by HP personnel. The team noted especially the presence of HP personnel in areas where work was being performed.

In its inspection of ongoing maintenance and work procedures, the team found that attention was being focused on employee safety and accident prevention. The licensee specifically holds each employee accountable for adhering to safety rules and safe work practices. The team observed employees wearing safety glasses, gloves, and safety shoes as required. An inspector also observed a supervisor counseling a workman regarding safety requirements. Corporate safety personnel have also conducted safety audits of shop facilities. At Unit 2 three of the four assistant maintenance supervisors worked for 1 month with the corporate Safety Department as interns to receive specific safety training. The team found that for all three units safety principles were being incorporated well into the maintenance process and were being implemented.

The team also examined the process by which the licensee integrates regulatory documents into the maintenance process. Incoming regulatory documents are received and tracked by the corporate nuclear licensing group in accordance with Procedure NEO 4.01, "Communication with the Nuclear Regulatory Commission." Tracking is maintained by the correspondence tracking program (COTRAP). Each incoming document is assigned to a site-specific licensing supervisor. Incoming regulatory documents to the Millstone station are controlled by MAP 3.01, "Millstone Administrative Policy Controlled Routing System." The team selected for verification specific items including a bulletin and a systematic assessment of licensee performance report from a computer COTRAP report dated May 31, 1989. On the basis of the sample taken, the team found that the licensee's system for integrating regulatory documents into the maintenance process was well established and that management controls were in place to monitor implementation.

Conclusion

Technical support for the maintenance organization and overall maintenance process was functioning well for all three units. Management's policies and actions were proactive in regard to ensuring technical support for the maintenance process.

3. MAINTENANCE IMPLEMENTATION

The purpose of this part of the inspection was to determine the effectiveness of the established maintenance controls and, more importantly, the quality of work performed. The team evaluated the controls established in four areas: work control (Section 3.1), plant maintenance organization (Section 3.2), maintenance facilities equipment and materials controls (Section 3.3), and personnel control (Section 3.4). The team evaluated effectiveness through observation of work in progress and a review of completed work orders, procedures, other documentation associated with maintenance and the training of maintenance personnel, work in progress, tools in stock, and spare parts and held discussions with all levels of personnel.

3.1 Work Control

The objective of the inspection in this area was to evaluate the effectiveness of the maintenance work control process to ensure that plant safety, operability, and reliability are maintained. The team evaluated the following areas: review of work in progress, work order control, equipment records and history, job planning, work prioritization, work scheduling, backlog control, maintenance procedures, post maintenance testing, and completed work control documents.

Work control evaluations were based on (1) observations of in-progress maintenance and (2) evaluation of the control of the work implementation. The inspection included interviews, as appropriate, with all levels of the maintenance organization, technical support groups, and training staff. Examples of in-progress maintenance that the team witnessed and evaluated follow

Findings

Unit 1

(1) Replacement of Reactor Recirculation Pump 1A Seal (RRPS)

The seal failed and caused an unplanned shutdown on May 29, 1989. The RRPS replacement first involved rebuilding the spare seal. This required the immediate acquisition of one seal part (the stationary carbon face part 95-14) from another nuclear plant. The seal was reassembled, hydro-tested, and installed by a capable and dedicated work crew. Management oversight of the work was found to be adequate. The rebuilding and installation of the seal were well coordinated and excellent work order control was displayed enabling a difficult task to be performed with apparent ease.

The team found that the hydro-test, after the seal was rebuilt, was performed using a vendor instruction and not a Unit 1 controlled document. The licensee was responsive and committed to prepare a formal procedure for testing rebuilt seals.

(2) Replacement of Safety/Relief Valve (S/RV) 3C Top Works

This valve had exhibited a high tail pipe temperature during the Unit 1 startup. To replace S/RV topworks, tested topworks had to be sent by air freight from Wylie Laboratories. The topworks arrived in the late afternoon on June 1, 1989, and installation was completed by 10:30 p.m. The team also noted that the licensee had purchased 4 additional S/RV topworks to maintain a total of six spares in order to change out and test the entire complement of S/RV topworks each outage. This was more conservative than the technical specification requirement to test 50 percent of the S/RVs each outage. This testing frequency also exceeded the ASME Code Section XI requirements. The team also noted particularly the maintenance engineer's knowledge of S/RVs. The engineer is also chairman of the BWR Owners Group on S/RV setpoint drift.

(3) Repair of Service Water Pipe Corrosion

The work consisted of grinding out areas of corroded carbon steel pipe and rewelding. On the basis of its observation of the work and its review of welder and weld procedure qualifications, material certification, and nondestrictive examinations (NDEs) the team found that, the work was well performed, the documents were in order, and both were in accordance with licensees' and code requirements.

(4) Instrument and Control(I&C) Work

The team observed the tests and calibations performed under the following surveillance procedures:

- Surveillance SP-408D, Scram Discharge Volume High Water Level Functional Test/Calibration
- Surveillance SP-408E, Main Steam Line Isolation Valve Closure Scram Functional Test
- Surveillance SP-412P, Isolation Condenser High Pressure Actuation Functional Test/Calibration
- Surveillance SP-408F, Turbine Stop Valve Closure Scram Functional Test

All of the above work was performed under approved procedures by experienced and knowledgeable craft personnel. Administrative controls were implemented as required. Test instruments were controlled and calibrated.

Unit 2

(1) Replacements of "C" Charging Pump Packing

The team found that the replacement and repair of the "C" charging pump packing and the NDE liquid penetrant examination of the bore combined with the semiannual and annual preventative maintenance were performed in accordance with the work package procedure. Qualified personnel effectively performed this work, parts and tools were controlled, and ALARA provisions were included in the work package. The work control was well coordinated and was performed efficiently. The team observed constant interaction between the PMMS planner and operations personnel so that mechanical and electrical work was performed in a timely fashion to prevent multiple tagging and additional exposure to personnel.

Observation of the "C" charging pump packing repair motivated the team to review the "C" charging pump's repair history. The review revealed a continued need for repair at an increasing frequency. The time between the current repair (AWO-M2-89-07058) and the previous repair had been 1 month. This frequent maintenance activity indicates a need for additional licensee review of the problem. The team, however, did not identify a safety concern regarding the repair frequency at the time of the inspection.

(2) C" Reactor Building Closed Cooling Water Heat Exchanger Coating

Preparation work for applying a corrosion resistant coating on the inside head area of the heat exchanger was observed. The removal of the heat exchanger head and the preparatory work were performed effectively. The team walked down the valve isolation for the heat exchanger work and verified that tagging was in place on the specified valves in accordance with the work package. Work control requirements were met and were effective.

Unit 3

(1) Replacement of Main Steam Safety Valves (MSSVs)

The team examined three 6-inch by 8-inch dual-outlet Dresser MSSVs in the maintenance shop. These valves had just been refurbished and returned by Crosby Valve Company. The team reviewed the 18-month required surveillance/maintenance performed under AWO-M3-89-09984 and verified that the entire complement of 20 valves had to be tested because of the number of valves that did not meet the required setpoint tolerance. This necessitated the issuance of a plant incident report (PIR) and a licensee event report (LER). The three reworked valves were replacements for problem MSSVs: one that had exhibited slight leakage and two that had unreliable setpoints. The team observed the valves being installed. The installation of these valves (22B, 24A, and 24B) required the removal of several additional valves because of the space requirements for the dual-outlet configuration. The work was performed well by qualified craft personnel and the AWO procedures were followed. The team further determined that the licensee's proposal for expanding the setpoint tolerance on the basis of plant-specific reviews of FSAR accident analysis as proposed in the PIR and LER, was a well-thought-out and appropriate action.

(2) Maintenance of Pressurizer Safety Valves (SVs)

The team reviewed AWO-M3-88-04104 issued for the maintenance of the pressurizer SVs and determined that the licensee maintains three spare SVs. This enables all three SVs to be changed each outage and is more conservative than the code requirements. Work control and test procedures fully detailed the work requirements.

(3) Repair of Valve MSS*HV28D

Valve MSS*HV28D (bypass of main steam isolation valve) was being repaired by Crane Company under AWO-M3-89-02846. The team observed the "dressing-out" of the packing box that had been slightly eroded. The repair was appropriately performed by extremely capable personnel; however, the AWO did not specify or contain a repair procedure, post-maintenance test, or acceptance criteria. The team reviewed the AWOs for other similar types of repairs and determined that this omission was an isolated case. The licensee committed to provide the missing procedural details before final acceptance of the work specified in the AWO.

(4) Repair of B Sulzer Main Steam Isolation Valve (MSIV)

The team observed the repair of the "B" Sulzer MSIV, which had the outer flow path blocks and solenoid valves removed. It observed that this valve is of a different design and more complex than those generally found at other sites. The work was carefully performed by qualified craft personnel in accordance with the work package maintenance procedure.

(5) Repair of Charging Pump 3CHS*P3A

The work to be done on charging pump 3CHS*P3A was removal of the coupling, inspection measurement, investigation of a noisy bearing, and a 6-month prevention maintenance lubrication. The team found that the AWO package was complete, the craft work performance was good, and management oversight was evident.

(6) Rebuilding of "C" Reactor Coolant Pump Seal

The "C" reactor coolant pump seal, was being rebuilt in accordance with Maintenance Procedure MP 3740 FC and AWO M3-89-10117. The inspectors found that the procedure was followed, parts were controlled, work was performed in a controlled location under ALARA requirements, craft personnel were qualified, and a vendor representative from Westinghouse was a member of the repair team. The inspectors observed that the repair team work was being performed effectively.

(7) Repair of Fire Damper 3*HVQ-1061 in Emergency Safety Features Building

The repair required the addition of weights to the damper to enable proper closing. AWO M3-89-08559 contained explicit instructions, including drawings describing the placement of the weights and their permanent attachment to the damper. The observed repair was properly performed in accordance with the work package.

(8) I&C Work

The team observed the work performed under the following work orders:

- M3-89-09033, FCV 520, Feedwater Isolation Valve Position Indicators
- M3-89-09048, FCV 510, Feedwater Valve Position Indicators
- Surveillance SP 3442 J01, Rosemount Wide Range Pressure Transmitters, PT 403 and 403A

It also observed the removal of the bypass jumper to reinstate HVC-16 to B train power.

All of the above work was performed under approved procedures by experienced and knowledgeable craft personnel. Appropriate postmaintenance testing was performed. Administrative controls were implemented as required. Test instruments were controlled and calibrated.

The team found that work control was extremely effective because of the PMMS and the automated work order (AWO) used to control work. The PMMS was used to schedule and track AWOs, to maintain information on the master component list, and to provide trouble reports, current work status, prior AWO maintenance data, completed AWO histories, and over 70 different printed reports for management's use. The PMMS provided instant access to obtain needed information.

Administrative Control Procedure ACP-QA-2.02C, "Work Orders," defines the process for controlling maintenance work at each of the units. This procedure defines responsibilities, the use of AWOs from origination through completion, and final acceptance by the Operations Department.

The PMMS planners and staff at each of the units have important roles in the planning and control of maintenance work. The team met with the PMMS planners at each of the units and found them to be extremely knowledgeable and capable in regard to all details of the AWOs and the scheduling, control, and feedback mechanisms of the PMMS.

The mechanical/electrical PMMS planner at Unit 1 appeared to have a heavy workload and had less staffing than did the ones at Units 2 and 3. The team made this concern known to the licensee, and the licensee committed to resolve the problem.

The AWOs contain work narrative, prioritization, safety-significance identification, health physics requirements, and authorization fields. During the inspection, the team accessed equipment and component history data from the PMMS. It found that both equipment data and information on the AWO history were current and constantly used and in each case retrieving the information was rapid and easily performed. In addition to the PMMS AWO histories, hard copies of entire AWO work packages were readily obtainable from microfilm records maintained by an efficient Station Nuclear Records Department.

The team also reviewed the licensee's provisions for performing emergency maintenance and found that emergency maintenance is not treated differently than any other maintenance except for priority, and work is continued until the job is completed. The use of the PMMS enables a work order package to be in the work area in less than 1 hour.

The team also determined that a detailed root cause analysis was in progress for the recirculation pump seal failure at Unit 1 as required by the plant incident reports (1-89-44 and 1-89-46). At the maintenance implementation level for recurring activities, in-depth root cause analyses are not normally needed or performed, and the team found no issue with this concept.

The team reviewed the effectiveness of job planning for those maintenance activities observed and for other completed AWOs for each of the units. At each unit, maintenance planning is performed by the maintenance management and the PMMS planner. There was a close interaction between the Operations Department and the maintenance planning staff in regard to determining availability of equipment, tagging equipment out of service, considering safety and implications pertaining to limiting conditions for operation, and coordinating the work efforts required of the different craft personnel.

At Unit 1, the "A" recirculation pump seal failure was cause for shutdown. During the shutdown, a spare seal was rebuilt and installed and the topworks for the "C" S/RV that had exhibited high tailpipe temperatures was flown back from Wylie Laboratories for installation. Planning was effective, the repairs were completed and the plant was running after only 4 days of down time. The team also observed that the repair of the "C" charging pump at Unit 2 and the replacement of three MSSVs at Unit 3 were well planned and coordinated. From the review of these and other activities observed, the team verified that exposure control was a consideration in the AWO.

AWO prioritization is based on station Administrative Control Procedure ACP-QA-2.02C, "Work Orders," which defines five levels of priorities. The first three priorities correlate to safety significance in descending order and time-frame commitments. The team also noted that balance-of-plant (BOP) equipment is not treated differently than safety-related equipment. The low BOP backlog provided positive indication that BOP equipment was being maintained.

During the inspection, the team determined that probablistic risk assessment (PRA) was not used as a basis to prioritize maintenance at the implementation level. The team determined that PRA is used at the design change level where choices are made between major efforts; at the craft implementation-of-work level there is not the defined need for and involvement of PRA.

The backlog at all three units was low and was attributable to good planning and scheduling, nondeferral of maintenance, management's attention and oversight of maintenance, constant communications, and the dedication of maintenance personnel. Unit 2 had the smallest backlog and through effective use of PMMS data and computers, produced a weekly chart with color graphics depicting the backlog.

The administrative procedure that controls the preparation, review, approval, and change process of procedure preparation at each of the units is ACP-QA-3.02 "Station Procedures and Forms." Additionally, ACP-QA-3.02A, "Writers Guide for Millstone Procedures," provides writing guidelines for developing and revising procedures and supplements ACP-QA-3.02. The team determined that these guidance procedures provide the necessary methodology, general instructions, and review requirements to develop appropriate unit procedures.

The team noted that the format of the procedures used for those maintenance activities observed was old style and could be enhanced with human factors considerations. During the inspection the team did see several newly formatted procedures that were excellent, and learned that procedures are being updated and that this updating is scheduled to be completed in 1992. Procedure MP 703.2, "Control Rod Drive Removal and Replacement," was a good example of the improved format.

During the observations and review of the replacement and repair of the recirculation pump mechanical seal at Unit 1, the team noted that the procedure, MP 741.1, for this work was in need of improvement. This procedure contained numerous multi-action, long-paragraph steps that could cause an item to be missed, and the clarity of the assembly drawing needed improvement. The licensee committed to update this procedure.

During observation of repairs to valve 3MSS*HV28D (MSIV steam bypass) at Unit 3, the team found that AWO M3-89-02346 and the work package did not list or contain a procedure for the work. This was determined to be an isolated instance, and the licensee has instituted action to correct this omission.

Station Administrative Control Procedures ACP-QA-2.02C, "Work Orders," and ACP-QA-2.02B, "Retests," contain requirements and provisions for retest of equipment and systems after maintenance. The AWOs for observed in-progress work and reviewed completed AWOs contained "retest/functional verification" and "acceptance criteria" fields. Although the AWO contains the retest and acceptance criteria fields, the team noted that these fields were not always completed in AWOs issued for Units 2 and 3. Further review of the station procedures showed that verification of satisfactory demonstration of operability is required by the Operations Department and a surveillance test and acceptance notation is placed on the AWO when completed. The team found discrepancies in several instances:

- Unit 1: AWO-M1-89-05748 issued for the rebuilding of a recirculation pump mechanical seal did not define a test procedure or acceptance criteria.

- Unit 2: The AWO-M2-89-09520 acceptance criterion of "normal packing leakage" was not considered definitive for a charging pump packing repair.

- Unit 3: During observations of work being performed on valve 3MSS*HV28D to repair packing leakage, AWO-M3-89-02846 did not define a test procedure or acceptance criteria.

Upon further review of ACP-QA-2.02C relative to retest and acceptance criteria, the team determined that the requirements were not definitive enough in describing what should be entered in this AWO field, who is to enter it, and when it is to be entered. This was applicable to all three units. The licensee has committed to strengthen this procedural area.

At each of the three units, the team reviewed completed AWOs both randomly selected and specifically selected because work in progress was observed. The review of AWOs by the PMMS planner and a lead department supervisor ensures all appropriate AWO actions are complete. During observations of work in progress, the team noted that the cognizant assistant maintenance supervisor and in several instances the lead department supervisor were present for the final review of the work.

During its review of completed AWOs at Unit 2, the team noted that the "cause of problem" field was not always completed. The team concluded that completion of this field would enhance the historical information. The licensee has committed to ensure that this type of information would be included.

Several proactive initiatives were also apparent to the team. At Unit 3 the operations coordinator on the PMMS staff has been effective in coordinating tasks, avoiding delays and work duplications, and controlling exposure. At Unit 2 the 3-month rotational assignment of one maintenance craft person to the PMMS staff aids in scoping AWOs and in training the craft person to improve input to the AWOs. At Units 1 and 2, the increased engineering staff within the Maintenance Department facilitates effective resolution of maintenance issues.

Conclusion

The in-progress maintenance observed by the team was well performed and controlled. Management was apprised of maintenance activities, and management oversight was always in evidence. Several isolated documentation omissions were found, but there were no instances of work not properly performed. The licensee's staff was professional, dedicated to good maintenance performance, technically competent, and responsive to correct any problem.

The AWOs used to perform work and the computerized multi-function PMMS used to schedule, track, and maintain current AWO data and to store equipment information, trouble reports, and completed AWO histories provide an effective maintenance work and management control system. The system is universally used at each of the units, and there is an ever expanding output of information. Station procedures provide the requirements for the preparation of AWOs and the development of maintenance procedures. Several findings of the team pointed to a need for improvement of the AWO procedure regarding retest and acceptance criteria.

The team concluded that from an overall perspective the licensee's in-progress maintenance and work control systems are functioning well.

3.2 Plant Maintenance Organization

The objective of the inspection in this area was to determine the effectiveness and extent of control exercised by the maintenance organization over maintenance activities, contractor maintenance personnel, deficiency identification and control, and maintenance trending.

Findings

Each unit has its own independent maintenance organizations that report to the unit superintendent. These organizations consist of mechanical and electrical maintenance personnel within one organization and instrument and controls personnel within another organization. The organizations for each unit are managed by a supervisor and assistant supervisors. Engineers are also assigned to the individual maintenance organizations. These organizations have policies, goals, and objectives, which are defined in both corporate and site procedures. Programs and procedures that describe the plant maintenance organization and its plans to comply with assigned goals have been written and issued. To ensure that the maintenance goals are complied with, management has established various auditing programs that evaluate the maintenance organization weekly, monthly, and yearly.

The team found that the maintenance organizations were staffed with sufficient personnel to perform assigned functions in a timely and orderly manner. The low level of backlog items in conjunction with the controls of the production maintenance management system (PMMS) demonstrated that the maintenance control systems are identifying and dispositioning their work in a timely and effective manner, thus maintaining these low backlog levels.

Plant maintenance activities in the areas of issuance of work, preventive maintenance, corrective maintenance, and rework are controlled and implemented through the (PMMS). The function of this system is discussed in Section 2.2 of this report.

The work elements described on the work orders issued through the PMMS are described in station maintenance procedures such as MP 790.9, a Unit 1 preventive maintenance (PM) procedure, or MP 3704A, a Unit 3 PM procedure. These procedures describe the general purpose of the document and then specify specific maintenance procedures or technical manuals. The team observed PM on 480-volt breakers both at Unit 2 and Unit 3. In each instance the team verified that the craft personnel performing the work were knowledgeable and were following their unit's procedures.

Both tool and equipment calibration numbers were required to be recorded on the test data sheets for the 480 volt breaker testing observed by the team. The A battery train test procedure for Unit 3 also required that the equipment calibration data and numbers be recorded on the test data sheets. The team verified that these data were documented when it observed the battery testing.

The team did not observe the return of the A battery system to service, but it did witness that the battery configuration was verified by the craft personnel after the battery testing was completed.

Maintenance personnel assigned to Units 1, 2, and 3 performed their tasks in a similar manner. Their training programs and technical guidance are similar and allow personnel to work at each site after receiving site-specific training. The team verified that both the electrical and I&C personnel were performing their work in accordance with the requirements of their procedures. The team also verified that postmaintenance testing was required by the component test procedures and that these tests were performed by the electrical and I&C personnel at the completion of the testing observed by the team.

During its observation of the Unit 3 diesel testing, the team also verified the diesel fuel oil tank filling process. A sample of diesel oil was removed from the oil tanker before the diesel oil tanks were filled. A fuel analysis was performed to verify the following requirements:

- American Petroleum Institute gravity: >27°-<39°
- kinematic viscosity: 1.9-4.1 centistokes
- flash point: >125°F
- clear and bright (pass/fail)

The above oil sampling was performed at the site and documented on Chem Form 3805AL-3. The oil sample passed the acceptance test, and the oil tank truck was allowed to fill the diesel oil storage tanks. On a monthly basis, a sample is taken from the fuel oil storage tanks and tested to the requirements of ASTM-D975-81, Table 1. The diesel oil testing as described above is performed at all three units. Each Millstone unit has a program for checking and dewatering its fuel oil storage tanks as well as a method for controlling oxidation and bacterial growth. The team observed the dewatering of the Unit 3 diesel fuel oil storage tanks during this inspection period. In each test observed, the derived system data were recorded, reviewed by management, and entered into the PMMS for data/history tracking.

During observations of charging pump repairs at Units 2 and 3, recirculation pump seal replacement at Unit 1, and MSIV and MSSV repair and replacement at Unit 3, the team found that the craft personnel were qualified and were performing the task in accordance with the AWO and procedural requirements. The team also verified operations and maintenance management's involvement in defining the need for the maintenance and also overseeing the activities. In its review of equipment and control room tag-out of equipment, the team found the methodology to ensure plant and system integrity to be effective.

The maintenance supervisory staff was fully aware of the repair work, and assignments were based on the qualification of craft personnel. For each work assignment, the AWO package contained the materials issue/return form listing the parts to be drawn from stores as well as the part numbers and the special tool requirements to perform the work. Accountability of work performance requires acceptance by maintenance management and then final acceptance and declaration of operability by the Operations Department.

Several minor difficulties were found in procedural control and acceptance criteria, which are being addressed by the licensee (see Section 3.1, "Work Control").

The Generation Engineering and Construction (GE&C) Division provides the management directions for the control of contractor personnel who work at Millstone Units 1, 2 and 3. The general training program that contractor personnel receive is the same as that given to the licensee site personnel. Specific training programs such as welding and electrical circuit analysis are given by the licensee at either its Berlin or Millstone training facility. A review of the construction personnel training records showed that each required course had been given and documented in the record file. Discussions with contractor personnel while they were supporting the Unit 3 electrical maintenance personnel showed that they knew and understood their work, including the site basic requirements and the requirements for working in radiation areas. The contractor personnel interviewed in the Unit 2 electrical shop were also knowledgeable of their work and site radiation requirements. The training program that the GE&C division provides to the contractor personnel, as modified for the unit, complies with the requirements of Nuclear Operations Policy NOP-3.01, Personnel training.

To support its contractor program, the licensee has established its own support organization called Myrock. This organization also provides trained craft personnel to work at the Millstone units. The team verified by sampling training programs and 15 training records that all personnel had completed their 1988 training requirements and were scheduled for their 1989 classes. The training courses were well defined and adequate for the level of training required.

The PMMS is a major element in maintaining the control and status of the PM program. The use of root cause analysis techniques trending reports, and plant history data are other methods used by the maintenance staff in supporting the maintenance program.

The maintenance organizations at Units 1, 2, and 3 performs their tasks through controlled procedures and detailed work order documentation. Site documentation and program controls are written that address such subjects as technical manuals, tool/material controls, work performance, trending analysis, root cause analysis methods and reports, and corrective action reporting. In addition to these programs, the PMMS program provides the maintenance managers with an overview of their maintenance program in areas such as corrective/preventive maintenance, backlog/rework status, inventory control, work order issuance, and status control.

Nuclear Engineering and Operations Procedures NEO 3.05, "Nonconformance Reports," and NEO 2.13, "Nuclear Plant Records Program," are the documents that describe the criteria for identifying deficiencies for Millstone Units 1, 2 and 3. Administrative control procedures (ACPs) are used at Millstone to reflect the requirements of the NEO procedures. To address the requirement for corrective action, administrative control procedure ACP-QA-10.10 was issued. This procedure describes the method and documentation required to issue corrective action request. During the testing of a Unit 3 480-volt breaker, an out-of-specification item was identified by the electrical maintenance personnel. The specification failure was documented, and the maintenance personnel completed the required forms that documented the failure, obtained a spare part, and retested the breaker. Their supervisor was aware of the failure and approved the scheduled rework/retest that was performed to the replacement part installed in the breaker.

During testing of the Unit 3 battery charger breakers, the maintenance personnel identified a condition where the swing charger and the normal charger breakers are both contained in the same motor control center cubicle. (See safety related 125 VDC and 120 VAC Drawing 323, Buses 32-2T and 32-2U.) An engineering study was performed of the charger design. A review of the engineering analysis by the team concurred with the dispositioning of the finding. Discussions with the maintenance supervisor indicated that he had been notified of the engineering analysis and recommendation and he had no further questions.

The team determined that the maintenance organization's system for identifying, reporting, taking corrective action, and closing open items is in place and being followed as described in the various procedures issued at this site. No violations or deviations were identified.

The identification of trends and significant items involving quality problems is well defined and implemented at Millstone Units 1, 2, and 3. NEO 2.11, "Trend Analysis From Quality Documents," defines the responsibility of the various departments. The root cause assessment (RCA) procedure is described in ACP-QA-10.12. The team reviewed two Millstone Unit 3 RCA reports: 059-89, "Missed LCO Action Statement," and 26-89, "SI Actuation." The RCA reports were well documented, decision steps were logical, and the root cause of the original concern was identified in the conclusions. To support the RCA program, the engineering staff has received the basic training program developed on this subject. An upgraded training program is being developed by the training organization for the engineering and maintenance staff personnel.

An NEO engineering self-assessment study of failures of motor-operated valves at Unit 3 was completed on May 23, 1989. The results of this study were being used by the Unit 3 engineering staff in determining if system changes or modifications were required. The overall results indicate that the negative impact of this failure mode on plant safety is not significant.

The PMMS produces various type of management reports with trending-type data, a basic output of this system. The PMMS coordinator for each of the Millstone units, for example, provides the maintenance manager with trending data in the areas of backlog status, preventive maintenance/corrective maintenance status, and work order status/history. The maintenance manager uses the PMMS information in planning daily work for his staff.

The above reports were examples of the type of reports that the team reviewed with the maintenance managers for the three Millstone units.

The team determined that there was close support between the maintenance organization and the other functional organizations within the Northeast Utility Company. The electrical and I&C engineering personnel supported the maintenance organization when requested. This was evident in the support provided by the electrical engineering organization to the electrical maintenance supervisor on the swing bus battery charger issue described earlier. The team also verified that the cooperation between the maintenance staff and the training staff in preparing training courses for the maintenance organization was closely monitored and well managed. Course needs and plans are discussed by the two organizations before a course outline is prepared. The training organization requests reports on its courses from the craft personnel who complete the courses. This feedback has improved the original training course.

The feedback and work interfaces between the various Millstone organizations were evident in the management meeting attended by the team. In discussions with maintenance, engineering, quality, procurement, and health physics personnel, the team determined that there was good communication between these organizations.

Conclusions

The maintenance organizations for each unit were well structured thus enabling them to perform their assigned preventive and corrective maintenance mission. Controls over maintenance activities were in place and well implemented by a knowledgeable and trained staff.

Contracted maintenance was well managed. The PMMS system provides management with status, trending, and various reports to assess maintenance whether ongoing or completed. Deficiencies were being identified and corrected. Overall, the team found that the maintenance organizations for all three units were functioning well and within the program plans for each unit.

3.3 Maintenance Facilities, Equipment, and Material Controls

The objective of the inspection in this area was to assess the plant's maintenance facilities and controls over maintenance equipment, tools, and materials to determine how well these elements support maintenance work. The team evaluated the following areas during this inspection: (1) provision of maintenance facilities and equipment, (2) establishment of material controls, (3) establishment of maintenance tool and equipment controls, and (4) control and calibration of measuring and test equipment.

Findings

The team toured the maintenance shop facilities at all three units and found that they were well equipped, well maintained, and located reasonably close to the facilities to be maintained.

The supervisor's staff offices were conveniently situated. The shop supervisors' offices were within the shop area, and most had windows and doors for a direct view of the shop areas. The planners' and engineers' offices were also close to the shop areas.

The Unit 3 staff maintenance was moving into newly expanded shop facilities at the time of the inspection. The Unit 1 maintenance staff had already moved into enlarged shop facilities. At Unit 2 improvements in the offices adjacent to the maintenance shop were being made.

Shop facilities were also available to handle radiation work; for example, pump seal lapping and the rebuilding of control rod drive units. The team found that the shops have adequate working space. Areas of each shop have been set aside for the storage of tools, materials, and high-use parts. The team found the maintenance, electrical and I&C shops and the overall maintenance facilities to be excellent at all three units.

The team verified, on a sampling basis, that policies and procedures were in place and implemented for the procurement of parts and materials.

Parts and materials for the three Millstone units are stored in the warehouse, which has facilities for Class A, B, and general open storage. The team verified that personnel access is controlled through a controlled access list. The access list is approved and updated by the site superintendent and the warehouse supervisor. The team noted that the warehouse area was clean and that parts and materials were identified and stored as required by purchase order requirements. The specific areas that were examined by the team were

- maximum/minimum ordering system
- documentation for traceability of spares
- the expediting of emergency procurement
- identification of acceptable sources
- shelf life
- guidelines for consumable material control
- receipt inspection
- storage (both normal and hazardous material)
- Documentation and traceability procedures used with purchase orders, inspection documents, and installation work orders

On a sampling basis, the team selected five items that had a shelf-life requirement and verified that they were maintained as specified in their specific purchase order criteria.

The use of commercial-grade items in safety-related applications is described in ACP-QA-4.03A, Revision 5, June 4, 1989.

To evaluate the present status of parts and materials in the warehouse and the control of new procurements, the licensee has established a Material control group, (MCG) to plan, schedule, and recommend an action plan to station management. To support the MCG, the Quality Services Department (QDS) has prepared the following procedures:

- QDS-2.12, Performing, Reporting and Follow-up of Procurement Audits
- QDS-3.04, Performance of Commercial Grade Periodic Surveys
- QDS-3.01, Procurement Document Review
- QDS-3.09, Inspection Status (Tagging)
- QDS-3.08, Performance of Receipt Inspection Activities

To support the above efforts at the Millstone site, the Generation Engineering and Construction Division has also prepared a commercial grade procurement specification, GE&C 4.09.

The licensee has established a training program pertaining to the above documents and the problems associated with commercial-grade procurements. It plans to have the quality receipt inspection personnel complete the courses during the last quarter of 1989. The MCG will have a schedule for an overall site personnel training program developed during the first quarter of 1990. Preliminary training has been given to both the engineering staff and quality services personnel on the basic parts/material upgrading procedures and planned programs. The team verified that the Manager of Technical and Nuclear Training is in the process of preparing training courses that address the procurement and dedication of commercial-grade spare parts. These training programs are to be reviewed with the MCG before they are implemented.

The issuance of ACP-QA-4.03A, "Upgrading Spare Parts for Use in QA Application - Commercial Grade Item Procurement and Dedication," and the establishment of the MCG are indicators that Millstone's management is aware of the problems in this area and has taken positive steps to address these issues. The upgraded training programs planned for this area are positive indicators that a planned program is being developed by the Millstone management to address this subject. Although much work still has to be done, management controls appear to be in place to resolve the issues.

Maintenance tools and equipment are controlled in accordance with procedure ACP-QA-9.04, "Control and Calibration of Measuring and Test Equipment." Tight controls are maintained on measuring and test equipment (M&TE) that has been checked out and returned. In its discussions with the responsible people in the Unit 2 calibration laboratory (which performs calibrations for all three units), the Unit 3 instrument and controls shop, the Unit 3 maintenance shop and the production test facility, the team found that the procedure is effective and is being followed. In addition, the PMMS shows when calibration is due and keeps a record for each instrument. A file is also maintained in each shop to record M&TE equipment that has been checked out and the AWO for which it is being used. The equipment number is recorded on the AWO for future reference if needed. The team found that the system used at Millstone to maintain, control, and document the use of M&TE tools and equipment works well.

The team found that the licensee's training facilities are excellent and considered them to be an overall asset to the maintenance process.

Conclusion

Maintenance facilities to support the maintenance process, including the training facilities, are excellent at Millstone. They are well designed and provide adequate space for maintenance work. The procurement program and warehouse were functioning well. Parts, tools, and equipment are controlled. Management is focusing attention on commercial-grade items stored in the warehouse; the team noted, however, that work still has to be completed regarding this matter.

3.4 Personnel Control

The objective of the inspection in this area was to determine the extent to which personnel are trained and qualified to perform maintenance activities. In assessing this topic, the team examined the following four areas: staffing control, training, testing and qualification, and current status. The team's evaluation was based on interviews, direct observation of the training facility and field activities, and review of documents and records.

Findings

Staffing control is established by NEO Policy Statement No. 2, "Qualified Nuclear Station Staff," dated March 10, 1982. The Northeast Utilities Service Company Senior Vice President of Nuclear Engineering and Operations has overall responsibility for establishing and maintaining a sufficient complement of qualified personnel within the nuclear engineering and operations group. The Vice President of Nuclear Operations is responsible for establishing and maintaining a sufficient complement of qualified personnel at the licensee's operating nuclear plants. Procedures for hiring, firing, and promoting personnel are contained in Northeast Utilities Personnel, Policies and Procedures, NUP-12 and NUP-20.

Organization charts are contained in NO-89-MP-361, dated April 18, 1989, and are current through April 1, 1989. Personnel job descriptions delineating types of crafts and numbers of personnel are present in the personnel office. A turnover rate reduction program has not been necessary at Millstone, since the current turnover rate is acceptably small, at about 7 percent annually, except for entry-level positions. Shift coverage is in compliance with Federal regulations for operating nuclear power plants.

Administrative Control Procedure ACP 1.15, "Management Program for Maintaining Emergency Preparedness," dated November 6, 1986, establishes and describes the program for maintaining the Millstone emergency preparedness program as described in the Millstone Emergency Plan. A methodology has been implemented to minimize maintenance backlog and to trend backlogs as they occur. Backlogs as previously discussed are very small. To date, no adverse personnel actions have been necessary because of intentional violations of maintenance or support group procedures.

The team verified that the organization charts and position descriptions were available to station personnel and were current. The promotion of station personnel to positions of higher responsibility is well controlled. Promotions are based on criteria such as training and performance evaluations.

Personnel training is implemented and documented with the publication and issuance of the General Nuclear Training Course Catalog in 1989. Feedback on training effectiveness is provided for at the end of each training session for plant and contractor personnel involved in the maintenance process. The licensee's training and qualification program was accredited by the Institute of Nuclear Power Operations (INPO) in January 1987. The initial training under the technical staff and manager (TSM) program includes plant fundamentals, plant modifications, plant outages, plant components, and plant systems for the three Millstone units and Connecticut Yankee. The TSM program also includes a continuing training section containing presentations on current industry events, and annual refresher training required for site access and issuance of dosimetry devices.

Initial indoctrination training courses under the TSM program for new employees include New Employee Training, Safety, Security and the Emergency Plan, Level I Radiation Worker, Introduction to Nuclear Systems: PWR, Introduction to Nuclear Systems: BWR, Nuclear Industry Requirements I, Nuclear Industry Requirements II, Introduction to Codes and Standards, and Plant Drawings.

Level 2 Radiation Worker Training, Steam Generator Mockup Training, ALARA Awareness, U.S. NRC Read and Sign, Medic First Aid Certification, Medic First Aid Recertification, SCBA Scott IIa and 4.5, SCBA Bio-Pack-60, Carbon Dioxide Fire Protection System, and Fitness for Duty Supervisory Training are courses offered as part of miscellaneous training. Level 3 Radiation Worker Training is offered as a part of the continuing training program.

Specific training for activities within a specific training or job activity such as maintenance may involve specific classroom and on-the-job-training. Training or safety-related or special maintenance activities is provided on an as-needed basis.

The team reviewed health physics refresher and initial training. The examination content indicated that the depth of the material covered in the courses was sufficient for the job category. Further, the team found that the training facilities were excellent. The team observed full-scale mockup training equipment for reactor cooling pumps and recirculation pump seals. Overall, training at the station is considered to be a strength.

Testing and qualification of maintenance personnel are thoroughly integrated into the maintenance process. Administrative Control Procedures ACP-QA-8.27, 8.28, and 8.29 contain the approved format for documentation of employee training and qualifications. Personnel qualifications are documented and traceable. Written examinations and lesson plans reviewed by the team in the area of system changes, health physics, and instrument and controls were comprehensive and of high quality. Good communications existed between the station staff and the training staff; this allows the training staff to adjust courses to current needs at the site. Staffing control for Millstone has been effectively established and implemented. Personnel training for general and specific as well as safety-related activities has been effectively implemented and is well documented. The licensee's training and qualification program is INPO accredited, documented, and traceable.

The only weakness noted in the personnel control program was the failure to implement an acceptable fitness-for-duty program. The original fitness-for-duty program implemented at Millstone was rescinded because of a conflict with State of Connecticut regulations. On June 7, 1989, 10 CFR Part 26 was issued, which supersedes State regulations and requires compliance within 180 days. The licensee is in the process of reimplementing a program under 10 CFR Part 26.

The licensee has an employee assistance program that provides assistance to employees who have problems with drug and alcohol abuse. The program appears to attract employees that need help.

Conclusion

Personnel controls at Millstone were implemented well and are supportive of the maintenance process. The team found a dedicated and interested personnel staff, an impressive training facility, and an effective test and qualification program. The only weakness noted was not having a currently implemented fitness-for-duty program. The licensee rescinded the existing fitness-for-duty program when it was in conflict with a State law, but will reestablish a program under 10 CFR Part 26. Overall, the team concluded that personnel controls were functioning well to support the maintenance process.

APPENDIX 1

Appendix 1 is a copy of the attachment to the April 13, 1989 letter to the licensee requesting site specific information

PRE-INSPECTION REQUESTED INFORMATION

To aid us in preparation for the maintenance inspection, please provide us with the following documents, procedures, and information in accordance with the designated numbers. If you do not have the requested document or information, it is not necessary to generate it to comply with this request. We recognize that many of the documents requested separately may be inclusive in a larger single document. Please provide three sets of the requested documents. A member of our staff will contact you regarding the best method of transmitting the documents to us. Please provide the information for each of the units, except if it is common and applies to all units, then only one set with three copies is needed.

Section 1-Description of General Plant Maintenance Activities

1-1 Maintenance administrative procedures which describe your corrective, preventive and predictive maintenance activities.

1-2 Organization charts including the maintenance organization and plant wide organizations.

1-3 Procedures, charts, and other documents which describe your Planning Department and its activities.

1-4 Documents which describe maintenance planning and scheduling meetings and status of maintenance reports.

1-5 Documents which describe the Maintenance and Operations interface during planning, scheduling, work start, work closeout, and post maintenance/functional testing.

1-6 Documents which describe your work control process: how a work order is started, planned, executed, completed, closed out, and equipment returned to service. Where contractors are used, how are they integrated into the process and controlled?

1-7 Documents which describe training and retraining of plant and contractor maintenance personnel including radiation protection specific training. (For maintenance activities only, do not include GET).

1-8 Documents which describe interfaces and communications among the technical support, engineering support, and the maintenance/I&C Departments.

1-9 Documents which describe maintenance work procedure establishment and control: Criteria as to when a procedure is to be used; initial writeup; reviews and approval; revisions; human factors reviews; QA reviews; requirements for conduct of work; troubleshooting criteria; work closeout; post maintenance testing and restoration of systems.

1-10 Description of methods by which maintenance performance is measured. Are performance indicators used? What are they? Who is informed of the results? Provide examples of periodic management reports that are used to assess maintenance performance.

1-11 Description of process for communications with vendors for technical services and latest technical information on equipment and systems installed at the plant, and interfaces with vendors or NSSS for training, modifications and equipment replacement.

1-12 Documents which describe the preventive maintenance and predictive maintenance programs.

Which equipment is included?
How is maintenance frequency determined?
What is done with results of these maintenance actions?

1-13 Documents which describe management involvement in maintenance.

Are there goals set for the maintenance and I&C Departments?
Are these goals used in the performance evaluation of managers and supervisors?
Are these goals communicated to first line supervisors and chiefs?

1-14 Documents which describe the Industrial Safety Policy and its incorporation into the maintenance program (safety manual, safety training, safety audits, accident reporting and investigations.)

1-15 Documents which describe the interfaces between Maintenance and Health Physics in work planning, scheduling, and actual performance of maintenance activities.

1-16 Indexes of department procedures.

Section 2-Status of Plant Contractor Personnel Who Perform Maintenance.

2-1 The number of craft personnel for electrical, mechanical and I&C maintenance organizations. Please include foremen and the foreman to craft ratio.

2-2 The average years of experience for each individual and the turnover rate.

2-3 Description of shift work and work assignments. How do licensee supervisors decide on which craft or contractor is to perform what type of work?

Section3-Status of Plant Equipment and Plant Maintenance

3-1 What equipment failures occurred during the last year of operations?

3-2 What equipment failures have been found during shutdown of plant, since and including the last refueling outage?

3-3 Describe maintenance and testing for diesel generators and 1E electrical equipment.

3-4 What component failures present greatest risk from a probabilistic risk standpoint to the plant and how is this information utilized in establishing preventive and predictive maintenance?

3-5 What have been the areas of high maintenance activity on safety related and non-safety related equipment and components?

3-6 Provide the following status concerning Maintenance Work Orders (MWO).

Current total listing and status of MWOs, number of planning, number in final sign-off, number on hold for lack of parts, number on hold for engineering assistance, number available to be worked on.
Projected number of corrective MWOs to be outstanding at start-up by priority.
Rate by completion of corrective MWO in terms of number completed/month and person-hours expended (by craft)/month for the past 12 months.

Current number of preventive maintenance work orders overdue.
Rate of completion of preventive MWO for the past 12 months.
Estimated man-hours required to complete current preventive maintenance MWOs
Number MWOs requiring rework over past 6 months.

3-7 Provide five corrective maintenance procedures for work that is scheduled for the upcoming outage (e.g., MOVs, PRVs, Solenoid Operated Valves, Safety/Relief Valves, ECS Pumps, Batteries, Switchgear, etc.).

3-8 Provide five preventive maintenance procedures that are scheduled for the upcoming outage.

3-9 Provide your overall outage schedule.

APPENDIX 2

PERSONS CONTACTED

Northeast Utilities

c E. Mroczka, Vice President Nuclear Engineering and Operations
bcd W. Romberg, Vice President Nuclear Operations

Northeast Nuclear Energy Company (NNECO)

B. Albee, Unit 3, Maintenance Assistant Supervisor
bc R. Asafaylo, Quality Services Supervisor
a J. Becker, Unit 2, Acting I&C Supervisor
acd N. Bergh, Unit 1, Maintenance Supersivor
ac R. Bonner, Unit 2, Maintenance Engineer
ab T. Burns, Unit 3, Assistant Chemistry Supervisor
D. Cleary, Unit 1, Maintenance Engineer
d T. Cleary, Unit 3, I&C Engineer
bcd C. Clement, Unit 3, Superintendent
ab T. Cummins, Unit 3, Health Physics
ac F. Dacimo, Unit 2, Engineering Supervisor
K. Deslandes, Unit 2, Engineer
F. Donahue, Unit 2, Maintenance Assistant Supervisor
abcd R. Enoch, Unit 3, I&C Supervisor
b M. Gentry, Unit 3, Operations Supervisor
b B. Griswold, Material Supervisor
G. Hall, Unit 2, Maintenance Assistant Supervisor
ab J. Harris, Unit 3, Engineering Supervisor
abc H. Haynes, Station Services Superintendent
b M Heinonen, Unit 2, Assistant Maintenance Supervisor
a E. Hemingway, Assistant Supervisor Stores
S. Kane, Unit 1, Engineer
bc J. Kennan, Unit 2, Superintendent
a B. King, Unit 3, ALARA
c J. Laine, Unit 2, Radiation Protection Supervisor
bc R. Laudenat, Station Superintendent Staff Assistant
W. Loweth, Unit 1, Engineer
a W. Nadeau, Production Manager, Fossil and Hydro, E&O
B. Nichols, Unit 3, Engineer
ac E. Owzewski, I&C Engineer, Unit 1
a C. Palmer, Health Physic Supervisor - Support
c R. Poole, Unit 2, PMMS Planner
abd P. Przekop, Unit 1, I&C Supervisor
ad J. Riley, Unit 2, Maintenance Supervisor
ab T. Rogers, Unit 3, PMMS Planner
abd R. Rothgeb, Unit 3, Maintenance Supervisor
ab R. Sachatello, Unit 3, Radiation Protection Supervisor
bc S. Scace, Millstone Station Superintendent
acd J. Stetz, Unit 1, Superintendent

Northeast Nuclear Energy Company (NNECO) (Con't)

ab S. Sudigala, Unit 3, Maintenance Engineer
abc J. Sullivan, Supervisor Health Physics Operations
R. Vogel, Unit 1, Engineering Supervisor
ac C. Wargo, Unit 1, Maintenance Engineer

Northeast Utilities Service Company (NUSCO)

bcd P. Austin, Manager, Reliability Engineering
ac M. Brown, Manager, Technical Training
c M. Ciccone, Senior Engineer, Licensing
c L. Chatfield, Manager, General Nuclear Training
c G. Closius, Supervisor, Quality Services
b E. Foster, Director, Generation Construction
ab D. Hoisington, Supervisor, Generation Construction
ac J. Kennedy, Test Supervisor, Production Test, Unit 2
bc C. Libby, Supervisor, Assessment Services
a T. McDonald, Supervisor, Training - Mechanical
a D. Nordquist, Director, Quality Services
abc G. Patterson, Test Supervisor, Production Test, Unit 3
c M. Sforza, Senior Engineer, Quality Services
abcd W. Varney, Manager, Plant Quality Services
b R. Viviano, Manager of Projects - Unit 3

United States Nuclear Regulatory Commission (U.S. NRC)

c N. Blumberg, Chief, Operational Programs Section
abcd D. Caphton, Team Leader, Senior Technical Reviewer
abc A. Finkel, Senior Reactor Engineer
abc H. Gregg, Senior Reactor Engineer
c P. Habighorst, Resident Inspector, Unit 2
abc L. Jones, Inspector (EG&G - Idaho Consultant)
abc P. Kaufman, Project Engineer
ab L. Kolonauski, Resident Inspector, Unit 1
abcd W. Raymond, Senior Resident Inspector
ab J. Stoffel, Inspector (EG&G - Idaho Consultant)
abc W. Thomas, Radiation Specialist

a. Denotes attendance at the entrance meeting on May 30, 1989.
b. Denotes attendance at the exit meeting for Unit 3 on June 9, 1989.
c. Denotes attendance at the exit meeting for Units 1 and 2 on June 16, 1989.
d. Denotes attendance at the final exit meeting on July 14, 1989.

The inspectors also contacted other administrative, operational, technical, and contractor personnel during the inspection.

APPENDIX 3

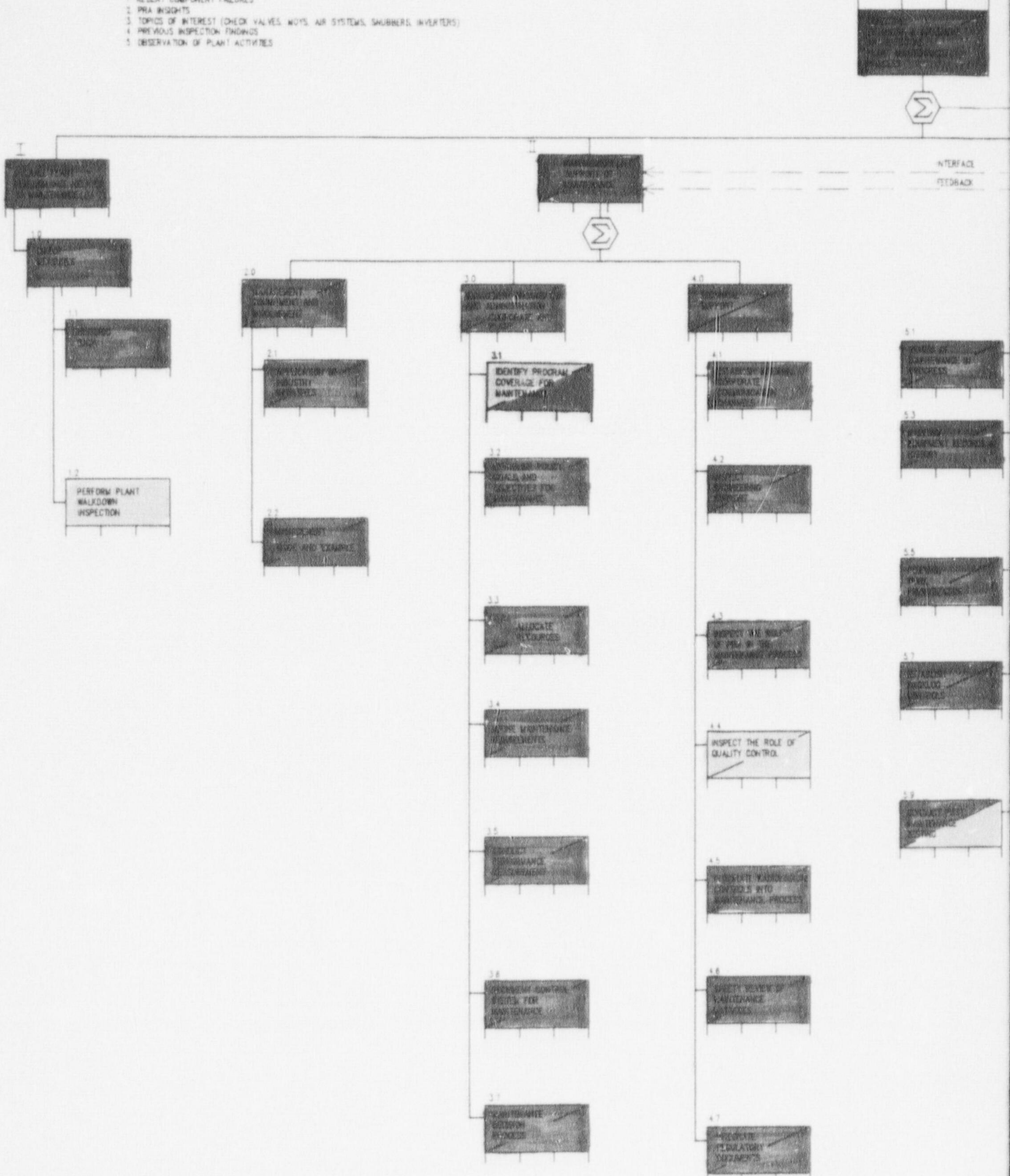
SUMMARY OF WEAKNESSES

Weakness - A potential problem or condition presented for licensee evaluation and corrective action as applicable	Reference to Report Section
1. Unit 2's high person-rem radiation exposure resulting from steam generator problems.	1
2. Greater attention to detail is needed while performing housekeeping and configuration control walkdowns in all three units.	1
3. NPRDS data is not typically used by Unit 3 maintenance and I&C departments.	2.1
4. NEO Policy Statement No. 31, "Nuclear Plant Maintenance," is lacking definition of lines of responsibility and who periodically reviews and updates the policy statement.	2.2
5. PMMS maintenance planning group staffing for Unit 1 during outage periods was minimal as evidenced by the quantity of overtime worked by the PMMS maintenance planner.	2.2
6. Work order procedure is weak in defining requirements for retests and acceptance criteria.	3.1

PRESENTATION TRE
MAINTENANCE INSPECTIO

TREE INITIATORS

1. RECENT COMPONENT FAILURES
2. PRA INSIGHTS
3. TOPICS OF INTEREST (CHECK VALVES, MOVS, AIR SYSTEMS, SNUBBERS, INVERTERS)
4. PREVIOUS INSPECTION FINDINGS
5. OBSERVATION OF PLANT ACTIVITIES

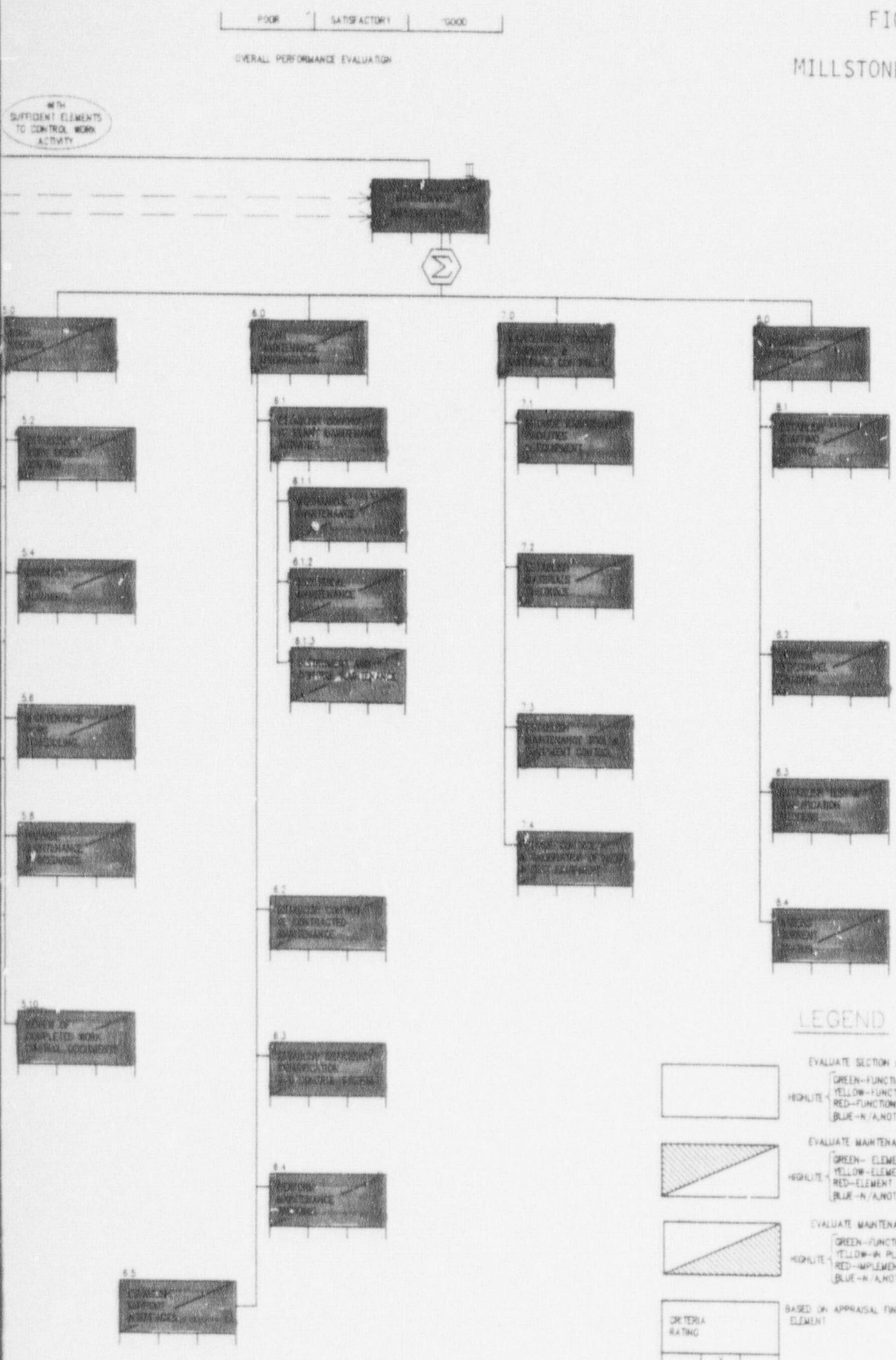


NOTE: THIS DWG IS USED IN CONJUNCTION WITH 425801, 425802, 425803, 425804, 425806, 425807 & 425808

E
N TREE

FIGURE 1

MILLSTONE UNITS 1 & 2



SI APERTURE CARD

Also Available On Aperture Card

LEGEND

EVALUATE SECTION I ELEMENTS

HIGHLITE
- GREEN—FUNCTIONING WELL
- YELLOW—FUNCTIONING ADEQUATELY
- RED—FUNCTIONING INADEQUATELY
- BLUE—N/A,NOT EVALUATED OR INSUFFICIENT DATA FOR EVALUATION

EVALUATE MAINTENANCE PROCESS ELEMENT ADEQUACY

HIGHLITE
- GREEN— ELEMENT WELL DOCUMENTED
- YELLOW—ELEMENT IS ADEQUATELY ADDRESSED
- RED—ELEMENT IS MISSING OR INADEQUATE
- BLUE—N/A,NOT EVALUATED OR INSUFFICIENT DATA FOR EVALUATION

EVALUATE MAINTENANCE PROCESS ELEMENT IMPLEMENTATION

HIGHLITE
- GREEN—FUNCTIONING WELL
- YELLOW—IN PLACE BUT COULD BE STRENGHTENED
- RED—IMPLEMENTATION MISSING OR INADEQUATE
- BLUE—N/A,NOT EVALUATED OR INSUFFICIENT DATA FOR EVALUATION

CRITERIA RATING

BASED ON APPRAISAL FINDINGS ASSIGN A RATING FOR EACH ELEMENT

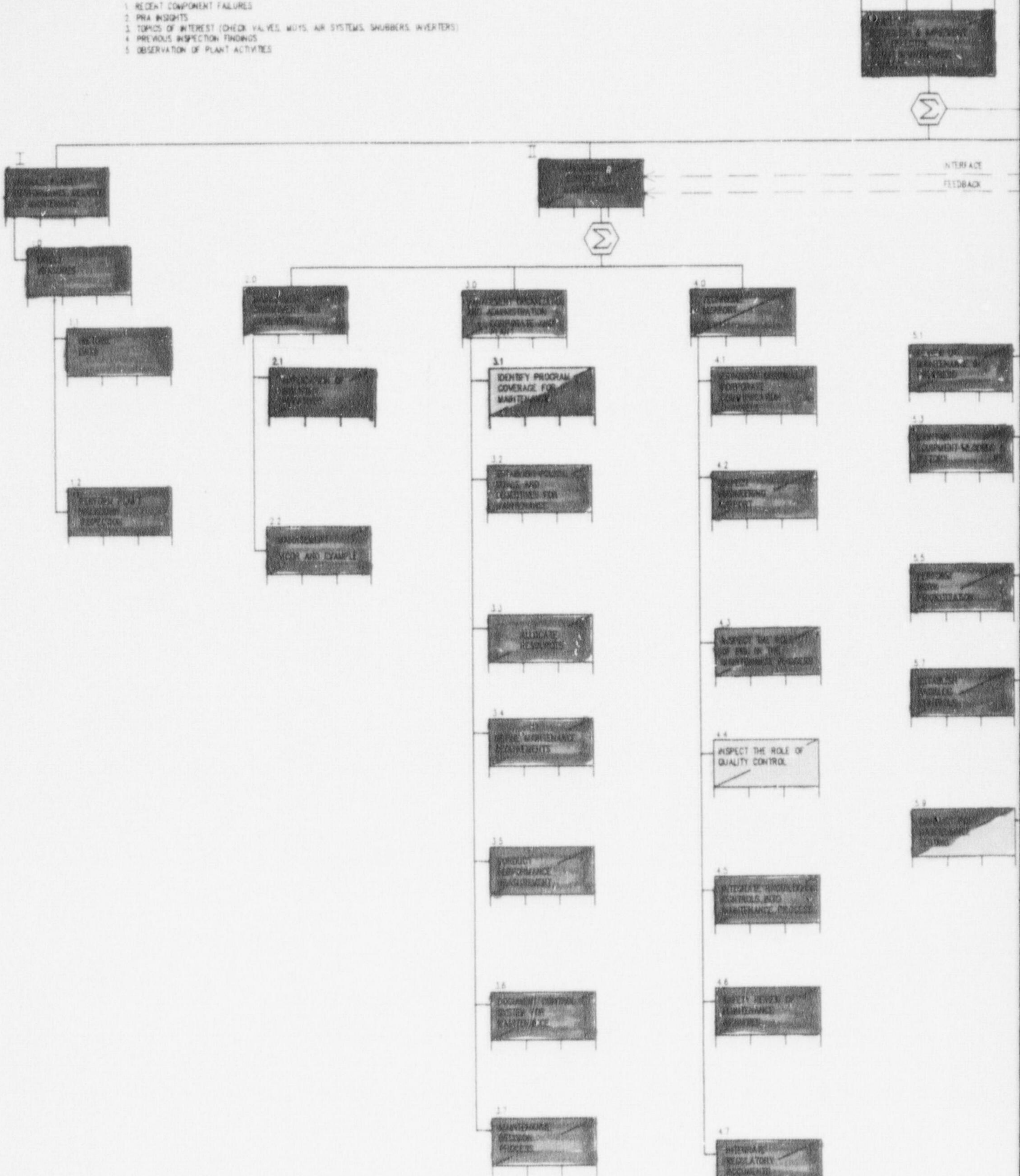
9/15/88
DRAWING NUMBER
425768-C

8909130294-01

PRESENTATION TRE
MAINTENANCE INSPECTION

TREE INITIATORS

1. RECENT COMPONENT FAILURES
2. PRA INSIGHTS
3. TOPICS OF INTEREST (CHECK VALVES, MOVS, AIR SYSTEMS, SNUBBERS, INVERTERS)
4. PREVIOUS INSPECTION FINDINGS
5. OBSERVATION OF PLANT ACTIVITIES

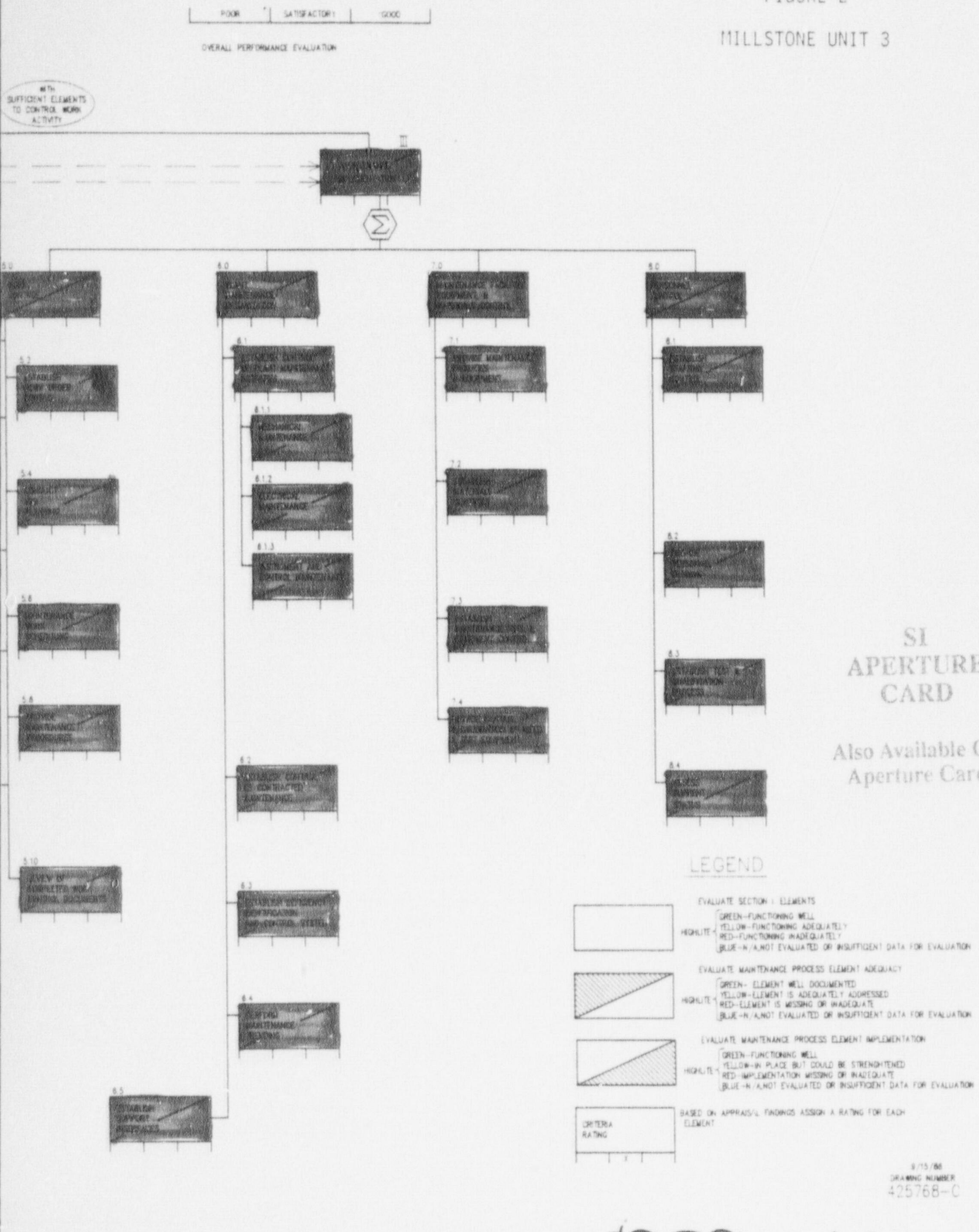


NOTE: THIS DWG IS USED IN CONJUNCTION WITH 425801, 425802, 425803, 425804, 425806, 425807 & 425808

E
N TREE

FIGURE 2

MILLSTONE UNIT 3



9/15/88
DRAWING NUMBER
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