UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-321/89-02 and 50-366/89-02

Licensee: Georgia Power Company
P. O. Box 1295
Birmingham, AL 35201

Docket Nos.: 50-321 and 50-366 License Nos.: DPR-57 and NPF-5

Facility Name: Hatch 1 and 2

Inspection Conducted: February 27 - March 17, 1989

Inspector: B.R. Crowley 5/22/89
B. R. Crowley (Team Leader) Date Signed

Team Members

G. A. Hallstrom
M. D. Hunt
P. J. Fillion
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Approved by: J. J. Blake 5/22/89
J. J. Blake, Chief Date Signed
Materials and Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This special announced inspection consisted of an in-depth team inspection of the Hatch maintenance program and its implementation. NRC Temporary Instruction 2515/97, dated November 3, 1988, was used for guidance.

Results: Overall, the maintenance program was judged to be "Good" with "Good" implementation. Areas of strength and weakness are highlighted in the Executive Summary with details provided in the report. Four violations were identified: inadequte administrative procedure - paragraph 3.a.; failure to complete adequate corrective action - paragraphs 3.b. and 3.c.; failure to take breathing air samples - paragraph 3.d.; and failure to follow acceptance criteria for weld patch on reactor building roof drain - paragraph 3.e.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

G. Brinson, Superintendent of QC
Y. Brown, Systems Engineer
H. Buchans, I&C Supervisor
*G. Barker, Superintendent of I&C
J. Cameron, Senior Maintenance Plant Engineer
B. Coleman, Supervisor, Document Control
A. Cowan, I&C Supervisor
G. Creighton, Senior Regulatory Specialist
*S. Curtis, Supervisor -Shift Technical Advisor
J. Dawson, Maintenance Supervisor
D. Davis, Manager of General Support
*W. Drinkard, Manager, Safety Analysis and Engineering Review
W. Duvall, HP Chemistry Supervisor
L. Ellgass, NPRDS Coordinator
*P. Fornel, Manager of Maintenance
*O. Fraser, QA Site Manager
G. Gill, Senior Maintenance Plant Engineer
*W. Glisson, Maintenance Engineering Supervisor
*R. Godby, Maintenance Superintendent
*M. Googe, Manager of Outages and Planning
F. Gorley, Operations Supervisor
R. Grover, Plant Engineer - Nuclear Safety and Compliance
*L. Gucwa, Manager, Nuclear Engineering and Licensing
J. Hadden, Supervisor, Plant QC
*J. Hammonds, Nuclear Safety and Compliance Supervisor
R. Hukill, Supervisor, Maintenance Support Group
B. Keck, Reactor Systems Engineering Superintendent
R. King, Discipline Engineering Supervisor
T. King, Maintenance Supervisor
W. Kirkley, Acting Manager of HP/Chemistry
J. Lanier, Senior Systems Engineer - Reactor Control
*J. Lewis, Acting Operations Manager
M. Link, Supervisor, HP Operations
A. Manning, QA Auditor
D. Matthews, Systems Engineer - Nuclear Boiler
W. Metts, Maintenance Supervisor
E. Metzler, Nuclear Safety and Compliance Supervisor
D. Midlik, Senior Maintenance Plant Engineer
L. Mikulecky, Senior Plant Engineer - Regulatory
*C. Moore, Plant Support Manager
*H. Nix, General Plant Manager
G. O'Donnell, I&C Supervisor
R. Ott, Supervisor, Training
R. Pooni, Acting Supervisor, Reactor Protection Engineering

ENCLOSURE 2

EXECUTIVE SUMMARY

Background

The Nuclear Regulatory Commission considers effective maintenance of equipment and components a major aspect of ensuring safe nuclear plant operation and has made this area one of the NRC's highest priorities. In this regard, the Commission issued a Policy Statement dated March 23, 1988, 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. As part of this inspection activity, the current inspection was performed in accordance with guidance provided in NRC Temporary Instruction 2515/97, Maintenance Inspection Guidance, dated November 3, 1988. The temporary instruction includes a "Maintenance Inspection Tree" that identifies the major elements associated with effective maintenance. The tree was designed to ensure that all factors related to maintenance are evaluated.

Conduct of Inspection

The maintenance inspection at the Hatch Nuclear Station was initiated with a site meeting on January 24-26, 1989, where the inspection scope, including the maintenance inspection tree, was discussed. At that meeting, the licensee presented to the inspection team leader an overview of the site maintenance program. In addition, a comprehensive package of material, as requested by NRC letter dated January 10, 1989, was provided for inspection preparation.

The inspection was conducted by a team consisting of a team leader and six inspectors. Four of the inspectors were from RII and two were from NRR. The team spent two weeks, February 27-March 3 and March 13-17, 1989, on site conducting the inspection.

The inspection was performance based, directed toward evaluation of equipment conditions; observation of in-process maintenance activities; review of equipment histories and records; and evaluation of performance indicators, maintenance control procedures, and the overall maintenance program. Based on known industry problems, plant specific problems, and discussions with the Hatch Resident Inspectors, the team selected five systems and directed the inspection toward determining whether these systems were being properly maintained and assessing if the current maintenance system would ensure proper maintenance in the future. The systems selected were: E11 (RHR), B21 (Main Steam), N21 (Condensate and Feedwater), P52 (Instrument Air), and E41 (HPCI).

The team performed walkdown inspections of portions of the selected systems to determine the material condition of the equipment. In addition, maintenance history records for the last two years were obtained and reviewed for any adverse trends. NPRDS data were also reviewed for the selected systems. In review of equipment history records, any questionable trends were examined in detail to determine if equipment was being properly maintained. In the course of the inspection, the team also observed general housekeeping and equipment condition for a large part of the plant.

Results

After completion of the inspection, the maintenance program was evaluated using the NRC TI and inspection tree as a tool. See paragraph 2 of the Inspection Report for details of the rating scheme.

The inspection results are presented pictorially in Figure 1 as the completed inspection tree. As noted in Figure 1, overall, the Hatch program for establishing and implementing an effective maintenance program was rated "Good" both in program and implementation. For the three major areas: (1) Overall Plant Performance was rated "GOOD", (2) Management Support was rated "SATISFACTORY" for program and implementation, (3) Maintenance implementation was rated "Good" for program and implementation. These ratings were based on specific strengths and weaknesses identified in the report details. The following are the more significant strengths and weaknesses identified:

Strengths

- Overall, the training program for maintenance was very strong. The facilities and the use of actual components as training aids were outstanding.
- In general, plant housekeeping was good.
- The maintenance data base and equipment records (NPMIS) were very good. The data base appeared to be user friendly and records were readily retrievable.
- The overall maintenance staff was a strength. Staffing levels appeared to be adequate. Team work was evident. Management was well qualified and enthusiastic.
- The QC staff was well organized, qualified, and heavily involved in the maintenance process.
- The licensee has a strong program for controlling the maintenance backlog. The backlog is low.
- The licensee makes good use of performance indicators.
- Overall, plant equipment condition was good.
- A strong program (deficiency card system) for identification of deficiencies and intiation of action was in place and appeared to be working well.

- Interfaces between maintenance organization and other organizations were well established and appeared to be working well. Daily planning meetings were well organized and appeared to be a strong point in the maintenance process.

- Both clean and "hot" machine shops were indicative of good maintenance facilities.

Weaknesses

- Weaknesses were identified in the PM program for electrical equipment in that vendor recommended PMs were not included in procedures and no documented justification existed for excluding the recommendations - examples: 4160 volt switchgear, busbars and cable compartments not included in procedures and no requirement to check protection characteristics for molded-case circuit breakers.

- Weaknesses were identified in the root cause analysis program as follows: the procedure needs strengthening to provide more detail on how to perform root cause analysis, a motor failure on a HPCI valve did not receive a root cause analysis, excessive time was taken to determine cause of Feedwater Pump Seal leakage.

- Responsibilities for Systems Engineers were not well defined.

- Some procedural weaknesses were identified - examples: the maintenance program procedure and predictive maintenance vibration analysis procedure needs to include cross reference to ASME Section XI requirements for ASME Section XI components; the maintenance program procedure needs to include additional detail relative to ensuring proper functional/operability test when changes are made to the MWO; and the procedure controlling the procedure update program was inadequate to insure that vendor recommended maintenance is included in maintenance procedures.

- Weaknesses in the program for personnel safety were identified - examples: failure to have unique fittings for connecting breathing air to instrument air and procedure for maintenance of electrical equipment could be strengthened by adding some safety precautions.

- The level and clarity of detail on some MWOs was poor resulting in difficulty in determining details of work performed - examples: MWOs 2-88-4862, 2-88-1906 and 2-88-3177.

- Weaknesses were identified relative to corrective action - examples: failure to properly torque upper mounting bolts on hydraulic control units (HCUs) and failure to ensure that all fittings for connecting breathing air were unique fittings.

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R. Pooni, Acting Supervisor, Reactor Protection Engineering

T. Powers, Engineering Support Manager
W. Porter, Senior Maintenance Plant Engineer - Vibration
J. Reddick, Supervisor, HP Support
P. Roberts, Plant Project Superintendent
*W. Rogers, Chemistry Superintendent
H. Scarbrough, Maintenance Supervisor
V. Shaw, Senior Plant Systems Engineer
J. Sherman, Reactor Control Systems Engineering Supervisor
D. Smith, HP Superintendent
R. Staines, Training Coordinator
M. Sutton, Training Supervisor
L. Sumner, Plant Manager
*S. Tipps, Nuclear Safety and Compliance Manager
J. Vaughn, Maintenance Supervisor
A. Vora, Senior Maintenance Plant Engineer
A. Wheeler, BOP Systems Engineering Supervisor
J. Wilkes, Superintendent of Planning and Control
D. Williams, Plant Systems Engineer - ECCS
C. Willyard, Senior Systems Engineer -ECCS
C. Wright, Shift Supervisor
R. Zorn, QC Supervisor

Other licensee employees contacted during this inspection included craftsmen, engineers, operators, mechanics, security force members, technicians, and administrative personnel.

NRC Personnel

*A. Herdt, Branch Chief, DRP:PB3, RII
J. Menning, Senior Resident Inspector
*E. Merschoff, Deputy Director, DRS, RII
*R. Musser, Resident Inspector

*Attended exit interview

Acronyms and initialisms used throughout this report are listed in the last paragraph.

2. Inspection Methodology

The inspection was performance based, directed toward evaluation of plant equipment condition and evaluation of maintenance for systems which have had problems. The systems selected for evaluation were based on the following:

- Known industry problems
- Review of Hatch LERs - Site Specific Problems
- Review of NRC Bulletins and Notices
- Review of Hatch Deficiency Reports
- Discussions with Resident Inspectors
- PRA information provided by NRR
- Inspector's Experience

Based on the above criteria, the following systems were selected for the inspection effort:

- E11, Residual Heat Removal (RHR)
- B21, Nuclear Boiler (Main Steam)
- N21, Condensate and Feedwater
- P52, Instrument Air (including P51)
- E41, High Pressure Coolant Injection (HPCI)

Maintenance for the selected systems was inspected by: observation of equipment condition (walkdown inspections), observation of in-process maintenance activities, review of equipment history records (MWO and NPRDS), and evaluation of performance indicators and trending data.

Based on the inspections performed, the maintenance program was evaluated using the inspection tree from NRC TI 2515/97 (see Figure 1). As indicated in Figure 1, three major areas of the licensee's maintenance program were evaluated: (1) Overall Plant Performance Related to Maintenance, (2) Management Support of Maintenance, and (3) Maintenance Implementation. Under each major area, a number of elements were evaluated, rated, and colored using the following guidelines:

"Good" Performance (Green)	-	Overall, better than adequate; shows more than minimal effort; can have a few minor areas that need improvement
"Satisfactory" or "Adequate" Performance (Yellow)	-	Adequate, weaknesses may exist, could be strengthened
"Poor" Performance (Red)	-	Inadequate or missing
(Blue)	-	Not evaluated

In general, the top half of the box (element) was rated depending on whether the element was in place and the bottom half was rated depending on how well the element was being implemented.

3. Significant Issues Identified

a. Maintenance on the Indoor Metal-Clad Switchgear for the 4160 Volt Distribution System.

During the inspection detailed in paragraph 4 below, the team identified issues regarding the recommended preventive maintenance, the maintenance interval and the quality of the preventive maintenance procedure for the 4160 volt metal-clad switchgear.

Procedure 52PM-R22-001-0S, specifies preventive maintenance work for the 4160 volt switchgear. The procedure covers verification of the undervoltage trip attachments (UVTAs are incorporated into one line-up per unit), breaker cleaning and inspecting (with breaker removed from the compartment), cell cleaning and inspecting, and relay/control wiring compartment cleaning and inspecting. The maintenance interval specified in the procedure was:

(1) Recommended 18 months for the UVTAs

(2) Required 60 months for four Unit 2 line-ups in Technical Specification 3/4.8.2.6.1b, which is related to containment penetration overcurrent protection.

(3) Recommended five years for all other switchgear.

Observations

Procedure 52PM-R22-001-0S, Rev. 3, was reviewed in detail by the team and all comments were discussed with Senior Plant Engineers (one from the maintenance group and one from the systems engineering group) and a Maintenance Foreman. One general comment made by the NRC, which applied to the circuit breaker portion of the procedure (Step 7.5), was that the procedure lacked sufficient detail. Relative to cleaning, inspecting and lubricating the breaker contact assembly, procedure Steps 7.5.6.2, 7.5.6.3, 7.5.6.9, and 7.5.6.11 apply. These steps do not adequately address the following PM items:

- Inspect all current carrying parts for evidence of overheating.

- Operate the breaker slowly, by using the spring blocking device. Check for binding or friction and correct if necessary. The manufacturer's instruction book gives detailed instructions on this step.

- Inspect primary contacts for burns or pitting. Wipe contacts with clean cloth. Replace badly burned or pitted contacts. Rough or galled contacts should be smoothed with a crocus cloth. Resilver where necessary.

- Inspect arcing contacts for uneven wear or damage.

- Figure 2-C, Contact Dimensions, indicates six dimensions that could be verified.

Relative to Step 7.5.6, Breaker Contact Assembly, the team made the following comments:

- The contact resistance test criteria of 500 micro-ohms should be 50 micro-ohms.

- In Step 7.5.6.5, the word "megger contacts to ground" should read "megger contacts to frame."

- The reference diagrams were difficult to read because of the small print.

- Addition of QC hold points should be considered.

Step 7.5.9.2 simply states "Clean and inspect all parts [of the stored energy mechanism]." The following PM items are not adequately addressed:

- Remove spring charging motor brushes. Measure brush length and compare to acceptance criteria. Replace brushes if necessary.

- Inspect motor support for loose or missing bolts and tighten or replace as necessary. (Refer to NRC Information Notice 88-42)

In addition to commenting on the level of detail in the procedure, the team also commented relative to items not identified for inspection that should be inspected. The program does not include periodic inspection and insulation resistance measurement of the switchgear bus. The outgoing cable compartment is not inspected, although the licensee stated that thermographic imaging of the cable termination was included in the predictive maintenance program. Procedure 52-R22-001-OS did not incorporate steps for inspection of the potential transformer compartment, although apparently maintenance work orders to inspect the PT compartment were carried out using that procedure. Furthermore, the NRC questioned the five-year maintenance interval since it was much longer than the one-year interval recommended by the manufacturer in his instruction book. (Refer to W Instruction Book S.O. 25-Y-9286-1, dated June 1975, page 48, Hatch No. SX-13698.)

Discussions were also held with key personnel in the training department relative to preventive maintenance on the 4160 volt switchgear. At present, there is no lesson plan but the licensee is in the process of developing a lesson plan for that topic as part of Phase V of the INPO training program. The licensee also stated that outside courses were not provided in this area. Therefore, plant electricians have not received training at Plant Hatch that could offset the lack of detail in the 4160 volt PM procedure.

The licensee's response to the above comments was as follows. The maintenance engineer who was involved in the discussions agreed to review and upgrade procedure 52PM-R22-001-OS with the objective of providing a detailed inspection checklist appropriate to the circumstances. The maintenance Engineering Supervisor stated that only four failures of the 4160 volt switchgear were reported to NPRDS for the two-year period from January 1, 1987, to December 31, 1988. He also stated that a survey was conducted of (five) other nuclear plants. Each of these plants reported using a PM interval greater than one year.

Conclusion

The NRC's position on the matter is as follows. The NRC's SER for Generic Letter 83-28, Item 3.2.2, Check of Vendor and Engineering Recommendations for Testing and Maintenance (All Other Safety-Related Components), transmitted July 29, 1987, is relevant to these inspection findings. Page 4 of that SER states: "Item 3.2.2 requires licensees and applicants to submit the results of their check of vendor and engineering recommendations. The licensee's supplemental responses dated August 21, 1986, and July 1, 1987, to Item 3.2.2 stated that a procedure upgrade program has been developed and designed to provide assurance that appropriate vendor and engineering information is either included or referenced in the procedures. The licensee indicates that Hatch Procedure DI-ADM-05-1085, Rev. 2, included a requirement to ensure that applicable vendor manuals and vendor and engineering recommendations are reviewed and are included in all procedures, not just test and maintenance procedures." Procedure 52PM-R22-001-0S, Rev. 3, had been through the procedure upgrade program; however, all the manufacturer's recommendations were not incorporated into procedures nor was proper documented justification provided for any deviation from the recommendations.

Procedure DI-ADM-05-1085, Rev. 2, was inadequate because it did not contain the instructions that would ensure that applicable vendor recommendations were included in the plant procedures as stated in the correspondence described above. The licensee is responsible for the maintenance program. Therefore, the licensee may, on occasion, deviate from vendor recommendations, but any such deviation should be justified by auditable documented analysis. The 4160 volt AC switchgear PM procedure is an example of the inadequacy of the controlling administrative procedure. Therefore, this matter represents a violation of NRC requirements, and is identified as Violation 321, 366/89-02-01, Inadequate Administrative Procedure.

b. Lack of Corrective Action on HCU Bolting

Background

The Team had reviewed NRC IN 87-56, "Improper Hydraulic Control Unit Installation at BWR Plants," previous to this inspection. IN 87-56 provides details of inadequate bolting on HCUs at two BWRs and notes that:

- The CRD system controls the position of the control rods within the reactor core either to change reactor core power or to rapidly shutdown the reactor (scram). The HCU is a major component of the CRD system that incorporates all the hydraulic, electrical, and pneumatic equipment necessary to move one CRD mechanism during normal or scram operations. This equipment, which includes the accumulators, CRD insert lines, CRD withdraw lines, and scram valves, is supported by the HCU frames.

- If a sufficiently large number of HCU frame bolts are missing or loose, a Safe Shutdown Earthquake (SSE) could result in damage affecting the ability of the CRD system to control the positioning of the control rods. In addition, damage to a CRD withdraw line could result in a small-break loss-of-coolant accident in the area of the HCUs.

The Team completed an inspection of the bolting for a majority of the Unit 1 and Unit 2 HCUs and identified one case of partial bolt engagement for an upper frame mounting bolt (Unit 2 HCU 46-23) and several cases (more than a dozen randomly dispersed betwen both units) where the upper frames of back-to-back HCUs appeared to indicate inadequate bolt torquing (upper plates exhibiting a gap rather than continuous contact).

Documentation Examined

Cognizant licensee personnel informed the Team of previous NRC Violation 50-321/86-20-02, regarding inadequacies (missing lock washers) from the Unit 1 bottom HCU mounting bolts. Corrective actions were to install the missing washers and verify torque of bottom bolts to 45-50 foot pounds for Unit 1 HCUs (MWO 1-86-7330) and verify torque of bottom bolts to 45-50 foot pounds for Unit 2 HCUs (MWO 2-86-3811).

The Team examined the documentation listed above and additional supporting documentation as follows.

- December 17, 1987 Correspondence from S. B. Tipps to C. T. Jones (Log: LR-REG-029-1287), regarding improper hydraulic control unit installation at BWR Plants - This correspondence states that in the process of resolving these NRC items, it was determined that during the construction of both Units 1 and 2 the torque value for the HCU hold-down bolts was not specified. The torque value information was subsequently obtained from GE (letter G-GPC-6-266 of July 22, 1986).

- July 22, 1986 Correspondence from GE to GPC (G-GPC-6-266), regarding Hatch 1 and 2 Hydraulic Control Unit Dynamic Qualification - Regarding loose hold-down bolts and missing flat washers, this correspondence states that, subject to the conditions that no previous upset or faulted events have occurred at the Hatch 1 and 2 site and that the six extreme bolts in the eleven bolt hold-down pattern are in place and are at least snug tight, the installed HCU's will remain operable through at least one future faulted event.

The six extreme bolts are the four bottom bolts and two upper bolts. The bolt torque values are given in the Reference 2 test specification. The relevant pages of that specification are provided as Attachment 1.

The team noted that Note 1 of Attachment 1 to GE Correspondence G-GPC-6-266 provided a limiting torque value of 50 foot-pounds for the 0.50 inch bottom bolts and 15 foot-pounds for the 0.375 inch top capscrews. The Team requested documentation verifying the torque for the Unit 1 and Unit 2 top bolts (capscrews).

Cognizant licensee personnel responded that the torque levels had not been previously checked for the top bolts but would be accomplished during this inspection.

Licensee Action

The licensee completed activities to torque the HCU back-to-back top plate mounting capscrews to 15-25 foot-pounds for all HCUs and confirm full thread engagement. (MWO No. 1-89-010977 for Unit 1 and MWO No. 2-89-00727 for Unit 2). Results revealed excessively loose bolts on 18 HCUs for Unit 2 and 5 HCUs for Unit 1.

Conclusion

After review of the above, the Team informed cognizant licensee personnel that this issue was considered a lack of conformance to 10 CFR 50, Appendix B, Criterion XVI and would be identified as Violation 321/366-89-02-02. Failure to Complete Adequate Corrective Action (See paragraph 3.c. for an additional example of this violation).

c. Failure to have unique fittings on the plant service air system (breathing air) outlets.

Background

The licensee is required to have unique fittings on the service air system to prevent inadvertent use of nonrespirable air when using supplied-air respirators. The need to have unique fittings was documented in a study made in 1981. The licensee also identified failure to have unique fittings for the Service Air System in 1987 and again in 1988. However, in 1989, the team determined that the licensee still did not have unique fittings for the service air system as identical fittings were found on Instrument Air and Service Air Systems. See paragraph 4.m. of the report for further details.

Findings

10 CFR, Appendix B, Criterion XVI, requires that measures shall be established to assure that conditions adverse to quality, such as deviations and nonconformances are promptly identified and corrected. The team determined that the licensee in the past had identified at least three examples of noncompliance relative to breathing air fittings and failed to take adequate corrective action to preclude repetition (see report paragraph 4.m below for details). The team stated that failure to take prompt and adequate corrective action for not having unique breathing air fittings is a violation of the Quality Assurance Program, 10 CFR 50, Appendix B, Criterion XVI and is another example of Violation 321,366/89-02-02, identified in paragraph 3.b. above.

d. Failure to Sample the Plant's Breathing Air System

Background

Administrative Control Procedure, 60AC-HPX-006-OS requires that respirable air supplied by air compressors and cylinders meet the minimum requirements of Grade D air as prescribed by the Compressed Gas Association Commodity Specification G.7-1-1966. The procedure further requires that respirable air be sampled at least quarterly. Further details are provided in paragraph 4.m.

Finding

Contrary to the above, the licensee failed to follow procedure 60AC-HPX-006-OS during the fourth quarter of 1988, in that the respirable air used to fill self-contained breathing apparatus was not sample and analyzed. This was identified as Violation 321,366/89-02-03, Failure to Take Breathing Air Samples.

e. Failure to Follow Acceptance Criteria for Weld Patch on Unit 2 Reactor Building Roof Drain

Background

During a general inspection of the 130 foot elevation of the Unit 2 Reactor Building, the Team noted a welded patch (approximately 3" x 4" x 3/8" plate) on the 20 inch schedule 10 Roof Drain (MPL No. 2T55-RSD-5) which exhibited apparent welding discrepancies. The 1/4 inch fillet weld attaching the patch to the drain pipe exhibited poor weld profile and excessive grinding (more than 1/16 inch below pipe surface). Further, the welder's ID was not stamped on the pipe.

The Team noted that this section of roof drain also served to maintain isolation of secondary containment and questioned the licensee as to whether adequate minimum wall thickness had been maintained for the excessively ground area. The Team further requested for review a copy of documentation showing acceptance of the present condition.

Licensee Action

Cognizant licensee representatives completed a deficiency card (No. 2-89-0505) during this inspection to accomplish ultrasonic thickness measurements which indicated that the ground area was reduced to 0.165 inch thick; i.e. less than the manufacturer's tolerance of 0.219 inch. However, the gouge did not violate the 0.145 inch design minimum wall thickness.

Documentation Reviewed

The Team reviewed documentation associated with MWO 2-85-1424 and QC acceptance of the initial weld dated March 27, 1985. Cognizant licensee personnel agreed that the initial acceptance had been in error since the weld inspection plan imposed at that time (A-MB-01, Rev. 1) prohibited excessive grinding and required an acceptable weld profile and the welder's ID stamp on the pipe.

During this inspection, cognizant licensee personnel completed an independent review of other welds accepted by the QC inspector involved and conducted additional training on weld acceptance. QC management personnel felt that the error on MWO 2-85-1424 had been an isolated example.

The Team completed an independent verification by examination of the QC program, interviews with several QC inspectors and reinspection of several welds recently accepted by the QC inspector involved. Further details of this review are included in paragraph 4.k. below.

Conclusion

After completion of the above, the Team concluded that the error in initial acceptance of the welded patch had been an isolated example, and that overall, QC at Plant Hatch was a strength in both program and implementation.

The Team informed cognizant licensee personnel that this issue would be identified as Violation 366-89-02-08, Failure to Follow Acceptance Criteria for Weld Patch on Unit 2 Reactor Building Roof Drain. However, due to the low safety significance, isolated occurrence, and previously completed licensee corrective actions, this violation will not be cited.

f. Programmatic Link Between Maintenance Procedures and ASME B&PV Section XI Requirements

Background

During the Team's examination of the Maintenance Program, a need was identified for additional requirements to ensure proper coordination and testing for ASME Section XI components. An equivalent need was also identified for the predictive maintenance program, particularly for vibration analysis. Details are listed below:

- Procedure 50AC-MNT-001-0S establishes the requirements and responsibilities for the control of maintenance activities at Plant Hatch. This procedure details requirements for intiating and processing MWOs. Additional details for MWO processing are included in procedure DI-OAP-10-0588N. Neither 50AC-MNT-001-0S nor DI-OAP-10-0588N clearly specify that for a Section XI component, Section XI programs are to be reffered to for determining post maintenance testing requirements. This omission is of concern due to the potential differences in post maintenance tests (functional tests) required for Section XI components versus other components.

- Preventive Maintenance Procedure 53PM-MON-001-0S describes the method used to obtain and analyze vibration analysis data for the purpose of detecting incipient failure of equipment. The program is intended to apply to preventive maintenance only and not to interface with any Technical Specification requirements. The procedure is applied by maintenance engineers and does not necessarily require that an MWO be issued. Section 5.2.2 states:

  "The vibration monitoring program governed by this procdedure is for preventive maintenance purposes only. When actual vibration levels exceed preidentified suggested maximum recommended levels, this does not necessarily mean that the associated equipment is inoperable, instead the information is intended for use as a diagnostic tool to indicate the need to perform additional testing, schedule future maintenance or do other analysis of equipment condition."

  The above is of concern since there is potential that the referenced vibration analysis can apply to a Section XI pump. In that case, if vibration results exceed the requirements of ASME, Section XI, Subsection IWP, Table IWP-3100-2 of Section XI must take precidence and proper actions taken to satisfy Section XI requirements.

Conclusion

Cognizant licensee personnel agreed that correction to 50AC-MNT-001-0S should be completed to require that an MWO for a Section XI component be so identified. However, licensee personnel were concerned that a predictive maintenance vibration analysis not be considered an equivalent to the Section XI type test. The Team concurred with this reasoning but noted that a full spectrum vibration analysis was presently being taken when monthly readings indicated a potential problem (i.e. a situation most apt to be equivalent to the Section XI alert or action range) and that the computer comparison to Section XI type vibrations in mils could be automatically accomplished. After further consideration the licensee agreed to the need for tying vibration test results to Section XI requirements.

The Team informed cognizant licensee personnel that NRC concern regarding a programmatic link between Section XI requirements and procedures 50AC-MNT-001-0S and 53PM-MON-001-0S would be identified as IFI 321,366/89-02-04, Programmatic Link Between Maintenance Procedures and ASME Section XI Requirements.

g. Inspection of RHR Hanger Weld Removal

Background

During a general inspection of QC activities, the Team became involved in discussions between engineering and QC supervision regarding final review and close out of MWO 1-88-5022. This MWO accomplished modifications of several RHR supports located in the Unit 1 Reactor Building. Changes included installation of a new embed support plate and adjustable rigid strut to the existing pipe clamp.

Additional repairs to support E11-RHR-H293 were required due to slag pockets in the existing welds which attached the pipe clamp support lugs to the pipe. The support lugs were removed and the weld area ground to sound metal. Field weld 1E11-HFW-059 was made to repair the ground area. However, there was no indication that a QC inspection of the excavated area (fit-up inspection) was done.

Technical Requirements

The Team noted that ASME, Section XI, Subsection IWA-4130, requires that:

Repair operations shall be performed in accordance with a program delineating essential requirements of the complete repair cycle ... including the flaw removal method, method of measurement of the cavity created by removing the flaw, and dimensional requirements for reference points during and after the repair ....

The Team also noted that paragraph 7.1 of licensee procedure 42EN-ENG-014-0S, states that:

> Documentation required by ASME Code is included in the scope of Repair/Replacement Program and shall include the following as applicable: a description of the flaw, the method which revealed the flaw and the location of the flaw; the flaw removal method and the depth of excavation; and an evaluation of the flaw or failure to ensure the selected repair or replacement is suitable prior to repair.

Documentation Review

- The Team reviewed quality documentation associated with MWO 1-88-5022 to re-verify the statements made above.

- The Team reviewed additional quality documentation to verify that:

  - A NDE (PT/MT) was intially required for the lug removal on Hanger E11-RHR-H293 (Step 8A on Work Process Sheet No. 81-058-M105).

  - The MWO was intially considered a Section XI replacement/ repair (R/R Applicability Checklist, dated September 8, 1988).

  - The repairs to 1E11-RHR-H293 received an engineering exclusion (R/R Checklist, dated November 15, 1988) with basis as follows:

    "When original construction installed lugs, 2 slag pockets were left in the pipe wall. This revision of the original MWO is to base metal repair pipe wall. This part of MWO is not in R/R program."

Licensee Response

Cognizant licensee personnel informed the Team that the engineering decision to exclude the repair weld from the Section XI R/R program also removed any requirements for NDE of the excavated area. Cognizant licensee personnel were unable to provide any alternative assurance that the flaw had been completely removed and were not aware of any programmatic requirements for flaw removal evaluation outside of those imposed for Section XI R/R components.

Conclusion

Cognizant licensee personnel informed the Team that a question regarding omission of the fit-up inspection for weld 1E11-HFW-059 had been raised by the ANII during review of documentation for MWO 1-88-5022 and final resolution had not yet occurred.

At the end of the inspection, this problem was still being evaluated by the licensee. The Team informed cognizant licensee personnel that NRC concern regarding programmatic requirements for examination/evaluation of welding flaws would be reviewed during a future inspection and identified as IFI 321,366/89-02-05, Inspection of RHR Hanger Weld Removal.

h. Design Verification of Containment Isolation Valves T48-F310 and F311

The Team examined licensee activities in response to NRC Generic Letter (GL) 88-14. The purpose of GL 88-14 is to request that each licensee review NUREG 1275, Volume 2 (Operating Experience Feedback Report - Air System Problems) and then perform a design and operation verification of their Instrument Air System (IAS). Verification was to include:

Item 1 - Verification by test that actual instrument air quality is consistent with the manufacturer's recommendations for individual components served.

Item 2 - Verification that maintenance practices, emergency procedures, and training are adequate to ensure that safety-related equipment will function as intended on loss of instrument air.

Item 3 - Verification that the design of the entire instrument air system including air or other pneumatic accumulators is in accordance with its intended function, including verification by test that air-operated safety-related components will perform as expected in accordance with all design basis events, including a loss of the normal instrument air system. This design verification should include an analysis of current air-operated component failure positions to verify that they are correct for assuring required safety functions.

A final requirement, Item 4, was to provide a discussion of the licensee's program for maintaining proper instrument air quality.

Background

The Team reviewed the licensee's initial response, dated February 10, 1989, to GL 88-14 and noted licensee statements as follows:

- The reviews and/or investigations to date indicate that the design, installation, testing, operation and maintenance of the instrument air systems at Hatch Nuclear Plant are adequate to ensure the proper and reliable operation of pneumatically operated, safety-related equipment.

- Upon completion of the additional evaluations, a subsequent report will be submitted. This report is scheduled to be provided by June 1, 1989. A final report will be issued upon completion of all actions associated with GL 88-14.

Documentation Review

The Team held discussions with cognizant licensee personnel and reviewed additional documentation associated with GL 88-14 activities as follows:

- Documentation associated with air sampling and station service air compressor (SSAC) maintenance and reliability.

- Documentation associated with design verification of MSIV, Containment Vacuum Breakers, and Containment Isolation Dampers (valves).

A complete list of documentation reviewed is included in paragraph 4.i.

Conclusions

The Team noted that the licensee had completed comprehensive activities in response to GL 88-14. However, design verification was not yet complete for critical components (Valves T48-F310 and F311). These valves are redundant to the torus vacuum breakers, and use instrument air pressure to maintain the valves in the closed position. Upon loss of air pressure, these valves are designed to open to allow the vacuum breakers to perform their safety function of preventing containment implosion. When the valves fail open, the isolation function of the valves is lost.

The Team further noted that the Unit 2 valves had failed LLRT testing during the last refuel outage. The Team informed cognizant licensee personnel that NRC concern regarding adequate design verification would be identified as IFI 321,366/89-02-06, Design Verification of Containment Isolation Valves T48-F310 and T48-F311. The resolution of this matter by the licensee will be reviewed during a future NRC inspection.

i. Failure to Have Adequate Procedures for Sampling Plant Breathing Air

Background

The licensee is required by 10 CFR 20 to sample respirable air to meet Compressed Gas Association Commodity Specifications G.7-1. The specifications define limits for oxygen content, hydrocarbons, carbon monoxide, and carbon dioxide. The licensee is required by licensee Technical Specifications 6.11 to have procedures consistent with

10 CFR 20. The Technical Specifications also requires that the procedures be approved, maintained and adhered to for all operations involving personnel radiation exposure.

Finding

The team determined that a licensee audit of health physics was being made during the inspection period and that the lack of procedures for sampling and analyzing Grade D air had been identified by the Quality Assurance Auditor. The inspectors determined that the licensee had also initiated some corrective action concerning sampling requirements. In order to review the licensee's corrective actions for failure to have a written procedure, IFI 321,366/89-02-07, Written Procedure for Sampling Breathing Air, was identified.

4. Inspection Details

The Team performed walkdown inspections, observed maintenance in process, reviewed maintenance history records and MWOs, and reviewed maintenance procedures to evaluate the overall maintenance program. The following paragraphs summarize the details of the inspections/reviews performed.

a. Walkdown Inspections

The Team conducted a general inspection of Units 1 and 2 turbine buildings, control buildings and reactor buildings. The inspection included observation of general equipment condition, housekeeping practices, deficiency condition and control, and identification practices for permanent plant equipment. In addition to general cleanliness, mechanical equipment was observed for water and oil leaks, corrosion, lubrication, proper fasteners, evidence of vibrations, etc. Electrical equipment was observed for cleanliness of equipment and general area (floor, etc.), painting, equipment grounding, corrosion, control wiring terminations, broke or missing relays, meters, lamps, etc., proper labels, conduit and tray fill and support, floor and wall penetration seals, bushing tightness, lighting, missing fasteners, cable tie wraps and supports, wire and cable nos., namplates, etc.

Appendix C is a list (not all inclusive) of the equipment and areas observed.

The following is a list of deficiencies identified by the team:

- Small leaks at valves 2C11-F046B, 2C11-F005, 1N21-N817B and 1N43-F138.

- Small steam leak at 1 inch union, E41 System, Unit 1, HPCI Room

- Missing insulation - About 2 feet of 2 inch diameter pipe near bottom of Unit 2 Main HPCI pump

- Conduit support and tubing on floor in demineralizer valve nest (Unit 1)
- Tag for valve 1N21-F447B laying on floor
- Valve 2P51-F087 handwheel tied in place with cable tie wraps
- At Unit 1 Main Generator Exciter Housing - conduit loose, bushing loose
- At Unit 1 Main Generator - stator cooling piping, insulation covers broken, and lamp covers missing at diode indicators
- 1P63-B001A Turbine Building Central Water chiller - water on floor
- 208V MCC 1G 1R24-SO-45 Frame 10 (RFPT 1A Hi Pres Steam) -corrosion on starter pan
- Turbine building leak allows rain water to drip near or into 1R22-S003 4.16 KV 1C SWGR
- Stator Water Cooling System - turbine building ground floor
  - Small oil leak at pump B
  - Valve 1N43 F138 Y-61 stator cooling make-up inlet - leaking
- H2 and stator cooling panel 1N43-P001 - annunciator "VAC TR OIL LEV HIGH-LOW" flashing
- At 1R23-S002 600V SWGR 1B - Some compartments have heavy dirt inside, example - normal feeder to turbine building chiller 208V SWGR 1A
- 4160-600V station service transformers have PCB insulation
- Transformer 1R23-S001 Small leak at fill valve
- Corrosion on diesel generator battery racks
- At battery 2R42-S002A, battery 2A - scrap and debris in sump drain may plug drain
- At cooling tower electrical house near tower No. 4 - metal building siding stored on vent fan enclosure
- Cooling tower No. 4 - loose grounding wire on SW corner

- At feedwater pump N21-C003A

  - 208 V panel - most cover bolts missing
  - condulet cover loose
  - scrap sheet metal stored in area
  - valve 1N21-N817B leaking

- Welding problems associated with a weld patch on the Unit 2 Reactor Building roof drain (see paragraph 3.e.)

- Redundant conductivity recorders (CE-N424A and CE-N424B) for recording condensate conductivity downstream of two of the demineralizers were inoperative. This was more a loss of convenience than a problem with system operation or safety as the conductivity is recorded by larger more accurate recorders in the demineralizer area.

The Team reached the following conclusions from the above examinations:

- General Equipment Condition

  Most of the maintenance items noted had not been identified by the licensee. However, all of the items were resolved during the inspection period by issuance of work orders or other acceptable means. The licensee presented similar punchlists of items identified during their walkdowns. When compared with the overall equipment condition and plant maintenance, the various housekeeping and equipment condition problems listed above were considered relatively minor.

- Housekeeping

  During the above inspection, the Team observed general housekeeping conditions. Programmatic Control of Housekeeping is maintained by procedure 51GM-MNT-002-0S.

  The Team noted a general high level of cleanliness within all areas of the plant. The Team consensus was that general plant housekeeping is a major strength.

- Deficiency Identification and Control

  The Team noted relatively few discrepancies without MWOs issued for correction. Further, no major discrepancies were identified without MWOs issued.

The Team consensus was that deficiency identification and control was a programmatic strength at Plant Hatch.

- ID of Permanent Plant Equipment

  During the above inspection, the Team observed that identification of permanent plant equipment was never in question, due to the use of equipment identification tags, decals, etc. which were prominately located, securely attached, and of a size to be clearly legible.

  The Team consensus was that identification of permanent plant equipment was a programmatic strength at Plant Hatch.

b. Repeat Failures - LPCI Inverters

During the evaluation of the maintenance program, various instances of what appeared to be repeat troubles/failures were examined. Discussions were held with various licensee personnel concerning repeat problems with LPCI inverters. The following summarizes the discussions and examinations:

During a period of 17 days, LPCI inverter 1R44-S002 was found to have blown fuses twice and LPCI inverter 1R44-S004 had a blown fuse once. After the third failure, an Event Review Team was organized to examine the problem.

Root cause analysis revealed that the failures were due to the installation of incorrectly rated parts which were supplied by the vendor. This problem was unique to this plant in that the output voltage for these inverters is 600V AC (Rather than the more common 480V) and the parts of the Plant Hatch LPCI inverters must be modified by the manufacturer. The parts were identified by the same part number as the 480V part, however, and therein was the problem. Failure to uniquely identify the modified parts led to the use of underrated parts. It should be noted further that there are similar inverters installed in other newly installed systems which have 480V AC as the required output.

The reports reviewed were complete and indicated that good engineering practices had been employed in solving this problem.

c. Feedwater Control System

Units 1 and 2 have experienced several feedwater control problems. These problems were also investigated relative to repeat failures. Following is a summary of the licensee's approach to solving these problems:

- It was determined by analysis of failure rate and consultation with GE that a certain manufacturer's capacitors were failing in the GEMAC components. I&C started a program to change out these type capacitors with more reliable ones.

- Based on a GE SIL recommendation, a DCR was initiated to remove the density correction instrumentation in the feedwater control loop. This DCR removed approximately 11 modules (GEMAC) which made the control loop more reliable due to a lower probability of a component failure. Of the GEMAC components that were left in the loop, the majority were replaced with TOSMAC components, a GEMAC equivalent made by Toshiba. Any components not having TOSMAC units for replacement were replaced with components (GEMAC) refurbished by GE. This DCR was completed on Unit 1 this past outage and will be completed on Unit 2 during the fall refueling outage.

- A problem was found with the cascade switch on the GEMAC controllers. The switches were found to be intermittent. A DCR was initiated to solder a jumper across the switch facilitating a much more reliable continuity path. This DCR has been implemented on Unit 1 but not on Unit 2.

- Recorders have been connected to various points in the feedwater control loop so that if a failure does occur, data can be collected for an accurate determination of the failure mode.

- Feedwater control problems on both Units have been reduced from feedwater swings occurring frequently, including Unit trips, to a feedwater level dip of approximately 4 inches at which time the controller immediately catches the decrease and compensates for it. These fluctuations happen very infrequently. The overall performance of the feedwater control system has been vastly improved.

In the above listed instances, the licensee solved their problems using a variety of different methods.

d. RHR System - NRC IN 87-30

During review of the RHR system, the Team examined the licensee's responsive actions to NRC IN 87-30, Cracking of Surge Ring Brackets in Large General Electric Company Electric Motors. The RHR Pump Motors 1E11-C002B and 1E11-C002D had been modified by installing new improved design surge ring brackets. The brackets for RHR Pump Motors 1E11-C002A and 1E11-C002C had been inspected and no problems were found. The surge ring brackets for the A and C RHR Pump Motors will be replaced during the next refueling outage. The work will be performed under Design Change Request No. 88-190, which covers the four RHR pump motors and the two core spray pump motors. It was further determined that the parts were onsite for the modifications.

For Unit 1, core spray pump motor 1E21-C001B had been modified and core spray pump motor 1E21-C001A is scheduled to be modified during the next refueling outage. The motors for the core spray and RHR pumps for Unit 2 are a different design and will not require modification.

It appears that the licensee responded well to this industry/vendor initiative and the NRC Information Notice 87-30.

e. Observation of In-Process Maintenance

(1) Repair of Intermittent Alarm on Station Service Battery Charger

Observations

The team observed the performance of MWO 1-89-00722 which was issued to repair an intermittent alarm condition on station service battery charger 1D. The AC voltage failure relay which was specified as the part to be replaced was incorrect. The MWO was revised and the under-voltage alarm relay was specified. The steps required to revise the MWO were followed including QC verifications.

The old under-voltage alarm relay was tested and the repeatability was out of tolerance. A new relay was installed. When the charger was re-energized, the AC voltage failure relay chattered. Voltage measurements taken indicated low output voltage (84 VAC versus 125 VAC). During the troubleshooting to determine the cause of the low AC voltage, it was discovered that the control fuse holder cover was loose. When the cover was fully in place, the AC voltage returned to normal. The fuse holder was examined and all fuse clips and cover fingers were cleaned to ensure proper electrical contact. The charger was returned to service. Later follow-up of the completion of this MWO revealed that the battery charger was only tested for proper operation. There was no evidence that the alarm function was tested.

Conclusion

Additional examination of this MWO and the process by which MWOs are revised revealed a procedural weakness associated with proper review of necessary post-maintenance test changes for revised MWOs. This is discussed in paragraph 5.c.(1).

(2) Cooling Tower Motor Changeout

Observations

The Team observed portions of a cooling tower motor changeout, protective relay calibration, recirculation pump motor generator set brush surveillance and 480 Volt circuit breaker trip device calibration.

Conclusion

In all cases, procedures were being followed and data carefully recorded.

(3) Replacement of Programmable Controller in Demineralizer Building

Observations

This activity was assessed with respect to the adequacy of the maintenance effort, whether applicable procedures were followed, and whether operations personnel were aware that the subject maintenance was being performed.

During this activity, an I/C technician was observed while replacing a backup battery for the programmable controller in the demineralizer building. This individual appeared to be well qualified for the task. He had previously worked for the manufacturer of the controller. The technician received the folder for MWO 1-88-8411 from the shift foreman; obtained a sign-off from the shift supervisor in the control room; and thereby informed operations personnel that the maintenance effort was to be performed; obtained the spare part (battery) from the warehouse; and replaced the battery. Proper installation of the battery was shown when the annunciator light for the controller cleared.

Conclusion

The task was well performed, applicable procedures were followed, and the control room personnel were aware that the activity was underway.

(4) Operability Test for RHR Pump 2E11-C002A

Observations

This activity was assessed with respect to adequacy of the maintenance effort, whether applicable procedures were followed, and whether operations personnel were aware that the subject maintenance was being performed.

During this activity, maintenance testing regarding RHR pump 2E11-C002A was observed. Procedure 34SV-E11-0012S was used to determine operability of the pump. The following actions were performed during the operability test: (1) telephone communication with control room personnel occurred, (2) oil level was checked, (3) verification that the service water valve opened, (4) the pump ran for five minutes, (5) the discharge pressure of 190 PSIG was read from the appropriate gauge, and (6) the discharge pressure was conveyed by phone to the control room.

Conclusion

The task was well performed, the applicable procedures were followed, and the control room personnel were aware that the activity was underway.

(5) Preventive Maintenance on Fire Pump 1x43-C001

Observations

The Team observed preventive maintenance on electric fire protection pump 1x43-C001 (MWO 1-88-08388).

The maintenance mechanics were working from a copy of Section 7.7 of procedure 52PM-X43-006-1S. Post-Maintenance testing of pump temperature and vibration as well as operability tests were completed.

In the course of performing the above preventive maintenance, the craftsmen noted that the relief valve was lifting while the pump was running and deficiency card 1-89-1209 was written.

During this inspection, the Team also noted a small water leak from jockey fire pump 1X43-C003. Deficiency card 1-89-1210 was written for correction.

Conclusion

The Team concluded that the fire pump preventive maintenance and post-maintenance testing were performed in accordance with the appropriate plant procedures. Deficiency cards were written for the deficiencies found in the course of the maintenance operations. No discrepancies were identified.

(6) Motor Shaft Pinion Key Replacement

Observations

The Team observed performance of MWO 1-89-308 to replace the pinion gear key (Part Number S/N 87160-63368) in MOV 1E41-F011 in response to NRC IN 88-84. Procedure 52GM-MEL-022-05 was used and a QC inspector was present.

A functional test on the reassembled valve was performed and indicated proper operating characteristics.

Conclusion

The Team concluded that the above corrective maintenance was performed in accordance with appropriate procedures. No discrepancies were identified.

(7) Overhauling of Waste Collector Pump Bearing

Observations

Following the performance of MWO 2-88-4862 to change the oil in Waste Collector Pump 2G11-C016, the plant equipment operator felt the inboard bearing and thought it was too hot.

MWO 2-89-400 was issued to "Rebuild" the pump using procedures 51GM-MME-0020 and 51GM-MNT-0020. Maintenance craftsmen ignored the "Rebuild" order and instead began "troubleshooting" the pump. The team observed the troubleshooting of the pump. The craftsmen could detect no sticking or grinding as the pump shaft was turned by hand. A maintenance engineer determined that the temperature and vibration of the pump while operating were normal. With a laser device, the engineer checked the alignment of the motor shaft with the pump shaft and found them properly aligned. Since the pump was operating normally, the MWO was closed out without further work.

Conclusion

The Team noted the proper activity of the craftsmen in response to the "trouble" involved. However, the Team consensus was that the MWO should have been more definitive regarding tasks to be accomplished.

(8) PM on Overcurrent Relay Calibrations

Observation

The Team observed the overcurrent relay calibration for Condensate Booster Pump 2A, Phase 3, per procedure 57CP-CAL-108-2S.

Conclusion

No problems were identified.

f. Electrical Maintenance

The Team reviewed the electrical PM procedures as detailed below. This inspection effort was directed at answering two questions:

(1) Were there procedures in existence to cover all the normal preventive maintenance activities that should be governed by procedures?

(2) Were the procedures of sufficient quality to be considered acceptable for maintenance work at a nuclear power plant?

Question (1) was addressed by studying the index of procedures and discussing with the Maintenance Engineers any apparent gaps that could be discerned from the index. There were about 27 electrical preventive maintenance procedures that applied to each unit. Motor maintenance was included in the maintenance of the driver equipment. Comments resulting from the procedure index review were:

- The fact that the maintenance program does not include protective trip testing of molded-case circuit breakers (other than containment penetration circuits) is considered a weakness.

- The fact that the maintenance program does not include periodic visual inspection of the 4160 volt current limiting reactors is considered a weakness.

To address question (2), the preventive maintenance procedure for the 4160 volt switchgear was reviewed in detail. Several comments were generated during review of this PM procedure which represent program weaknesses. Refer to Section 3.a. for complete details.

In order to help evaluate the effectiveness of the maintenance organization, the team reviewed the work history for the 4160 Volt System and the High Pressure Coolant Injection System for Unit 1. These reports gave maintenance work order details for at least the last two years. It was concluded from this review that repetitive failures of these two systems had not been a problem at Plant Hatch and that root cause analysis of problems for these two systems was satisfactorily carried out.

Trending reports, as an indicator of maintenance work control, were reviewed. One report, dated March 1, 1989, indicated that the total electrical corrective maintenance backlog was 52 work orders, which is relatively very low. Another report indicated that for 1989, all periodic/planned MWOs were completed within the allowable time.

Report No. 41, "Equipment with greater than five corrective maintenance work orders for 1988," indicated that repetitive failures of electrical components had not been a problem.

g. Machine Shop Facilities

Observations

The Team was able to observe general conditions and specific activities during this inspection for both the clean and "Hot" machine shops. The shops are well laid out with adequate space, equipment, and partitioning to accomplish a variety of tasks associated with machining, cutting and welding, troubleshooting and assembly/disassembly bench work. The clean machine shop also has adequate space and bench cabinetry for tool storage by individual mechanics.

The hot machine shop has less space and equipment than the clean machine shop, but large machine tools are installed and the space appears adequate for a variety of "Hot" machining tasks due to good organization of the space involved. A special "Bailey" building/facility is included for CRD repair. The atmosphere of the "Hot" shop is controlled, and radiation monitors, decontamination equipment and health physics support appeared adequate.

Conclusion

After review of the above, the team consensus was: the "Hot" and clean machine shop facilities were a strength in the maintenance program.

h. Craft Personnel and Training

Observations

The Team completed an overview examination of all phases of the licensee's training program for mechanical/electrical and I&C craft personnel by review of programmatic procedures, courses involved, and discussions with maintenance management personnel.

The Team also completed a review of the current interim classification matrix records for all mechanical and electrical craft.

In addition, interviews were conducted with a random sample of mechanical craft. Those interviewed were asked specific questions related to methods to minimize and control hot particles (radioactive particulates) during grinding, troubleshooting and repair of centrifugal pumps, inspection and repair of valves (including seat lapping, troubleshooting and repair of MOVs). General questions were also asked, regarding the following procedures:

50AC-MNT-001-0S, Maintenance Program
51GM-MNT-002-0S, Maintenance, Housekeeping and Tool Control
52CM-MME-001-0S, Repacking Valves and the Adjustment of Valve Packing
52CM-MME-005-0S, Limitorque Valve Operator Models SMB-0 through SMB-4 Mechanical Maintenance

All questions were saftisfactorily answered.

Findings

The Licensee's maintenance training program received INPO accreditation in April 1987. The training has been fully implemented and includes full time training coordinators. The training is completed in phases with an additional monetary incentive attached to each phase which ensures craft interest in advancement. An overview is as follows:

- Mechanical

  The mechanical training program consists of six phases. The completion of phases 1 through 5 is mandatory for all mechanics. Phase 6, however, consists of specialized skills training. All mechanics are not required to complete all courses in phase 6.

- Electrical

  The electrical training program consists of 6 phases. The completion of phases 1 through 5 is mandatory for all electricians. Phase 6, however, consists of specialized skills training. All electricians are not required to complete all courses in phase 6.

- I&C

  The I&C technician training program consists of 4 phases. The completion of phases 1 through 3 is mandatory for all technicians. Phase 4, however, consists of specialized skills training. All technicians are not required to complete all courses in phase 4.

- Continuing Training

  Continuing training modules for mechanical, electrical and I&C have been presented twice a year since these programs were accredited in April 1987. To date, four modules have been presented for each area.

Prior to completion of formal training, craft are assigned tasks using an interim qualifications matrix. The matrix was assigned to reflect evaluation of each craftsman by a qualification committee based on the applicant's prior job performance, knowledge, proficiency and training. Control is maintained by procedures DI-MNT-10-0287N, and DI-MNT-11-0278N. Craftsmen unable to satisfactorily complete the formal training course also loose their interim qualification and are considered not qualified for the area of concern.

Present maintenance management goals are to have all craftsmen fully certified (through phase 5 for mechanical and electrical and phase 3 for I&C) by the end of 1989.

Maintenance supervisors provide surveillance to assure that craft are adequately trained for the job assigned. The Team reviewed an example where supervisor surveillance during this inspection identified need for additional training for the craftsman involved.

The Team did identify a training deficiency since the training department did not provide any training for performing preventive maintenance on 4 KV switchgear. At the time of this inspection, a lesson plan for this was being developed as part of the phase V of INPO training program.

Conclusion

The Team consensus was that the Plant Hatch training program is a strength.

i. Instrument Air System (IAS)

Observations

The Team reviewed a listing of open MWOs on the P51 Service Air and P52 Instrument Air Systems for Unit 1 and Unit 2 to identify potentially recurring problems. The Team noted repeat problems with the station service air compressors (SSAC) and cognizant licensee personnel provided additional documentation as listed below.

The Team also examined licensee activities in response to GL 88-14 (see paragraph 3.h.). Documentation associated with design verification of MSIVs, containment vacuum breakers, and containment isolation dampers (valves) was also reviewed as listed below.

Documentation Review

The Team held discussions with cognizant licensee personnel and reviewed additional documentation associated with the above as follows:

- Documentation associated with air sampling and station service air compressor (SSAC) maintenance and reliability

  - Air Compressor Replacement Plan
  - System Engineering Concerns Regarding SSAC, dated September 20, 1988 (Log: LR-BOP-016-0988)
  - Management Action Plan regarding SSAC, dated September 21, 1988 (Log: LR-MGR-006-0988)
  - Management approved reliability improvement action, dated September 27, 1988 (Log: LR-MGR-009-0988)
  - Laboratory Analyses of eight air samples taken November 23, 1988, [(includes sample location, dew point (-°c), particle size (micron), oil content (ppm), carbon monoxides (ppm), carbon dioxide (ppm)]
  - ANSI Standard ISA-S7.3, Quality Standard for Instrument Air
  - Unit 1 PM Procedure 52PM-P51-001-1S
  - Unit 1 PM Procedure 51PM-P51-001-1S
  - Unit 2 PM Procedure 52PM-P51-001-2S

- Documentation associated with Design Verification of MSIVs, Containment Vacuum Breakers, and Containment Isolation Damper (valves)

  - January 13, 1987 Correspondence from G. A. Goode to S. B. Tipps (Log: LR-PES-016-0187) regarding testing for Unit 2 MSIV closure times with and without air supply (Note: MSIVs B21-F022A-D and F028A-D met the 3 to 5 second closing time both with and without air supply)

  - June 11, 1987 correspondence from T. Powers to J. Kane (Log: LR-ENG-011-0687) regarding relief from ASME Section XI, Subsection IWV-3415 requirements to allow continued testing of MSIVs without isolation of the gas supply to the accumulators during normal surveillance testing.

  - Follow on correspondence of August 3, 1987, August 18, 1987 and September 4, 1987 regarding MSIV fail-safe testing requirements.

  - March 2, 1989 correspondence from BPC to GPC regarding design verification of drywell/torus vacuum breakers (T48-F323A-L); torus/reactor building vacuum breakers (T48-F328 A & B; and Unit 1, 18 inch purge valves (T48-F318, F320 and F326).

- March 9, 1989 correspondence from K. W. McCracken to L. T. Gucwa regarding design verification of containment isolation/vacuum relief valves T48-F310 and F311 and T48-F328 A & B.

- April 19, 1988 correspondence from GPC to NRC regarding LER 88-004-01 (LLRT failure of Unit 2 valves including T48-F310 and T48-F311).

Conclusion

The Team concluded that the licensee had completed comprehensive activites in response to GL 88-14. However, the Team noted a continuing concern regarding design verification of valves T48-F310 and F311. Discussion provided in paragraph 3.h.

j. Preventive Maintenance (PM) Program

Observations

The Team reviewed procedures, held discussions with maintenance engineering personnel and observed activities associated with predictive/preventive maintenance.

The Team also examined historic documentation demonstrating use of predictive maintenance to prevent incipient failure on large rotating equipment.

Findings

The licensee's predictive maintenance program includes vibration analysis, lube oil analysis, equipment performance analysis, infrared analysis, and analysis of maintenance history. The program is run by maintenance engineers and controlled by procedure 50AC-MNT-007-0S. Other procedures involved include 53PM-MON-002-0S and 53PM-MON-001-0S.

An NRC concern was identified regarding need for a programmatic link between preventive maintenance and ASME, Section XI requirements. Details are included in pargraph 3.f.

Conclusion

The Team consensus was that the Preventive Maintenance Program was a programmatic strength.

k. Quality Control (QC) Program

Observations

The Team completed an examination of the QC program; interviews with QC management and several QC inspectors; and reinspection of several welds recently accepted by the QC inspector involved with the weld patch problem on the Unit 2 reactor building roof drain (see paragraph 3.e. above). Further details on examination of the QC program are listed below. (Note: The Team was aware of details associated with previously identified NRC violation 321,366/88-31-01 of a related nature and responsive licensee correction actions. However, those corrective actions were not examined in detail since full compliance is not anticipated before September 1989).

Findings

The Plant Hatch QC Program provides the following:

- 24 hour shift coverage for I&C, Electrical, and Mechanical Maintenance
- Inspection of safety systems and selected Balance of Plant systems
- NDE testing and evaluation
- Monitor of welding qualification and performance
- Final MWO closeout reviews
- Material Receipt Inspection

The following controlling procedures were reviewed and found to be adequate:

GEN-12750
40AC-QCX-001-0S
45QC-INS-004-0S
45QC-INS-005-0S
45QC-INS-006-0S
45QC-INS-008-0S
45QC-QCX-002-0S
45QC-QCX-009-0S
45QC-PQL-001-0S
45QC-QCX-001-0S

The ANSI N45.2.6. and SNT-TC-1A certifications of all (24) QC inspection personnel were reviewed and found to be current. All inspectors are certified to visually inspect welding activities.

Interviews were held with six QC personnel. Specific questions were posed relative to acceptance criteria and other details of the procedures listed above. All questions were adequately answered with clear and specific detail.

The following welds recently accepted by an inspector were re-examined and verified as acceptable.

MWO No.	Weld No.
1-88-07300	FW001
2-89-0619	FW Nos. 1 through 8

Conclusion

The Team consensus after examination of the above was that Quality Control at Plant Hatch was a strength in both program and implementation.

l. Engineering Support

Observations

The Team interacted with several systems engineering personnel during examination of potential repetitive failures of critical components (see paragraphs 4.t and 4.x below); IAS GL 88-14 activities (paragraph 3.h.); corrective actions associated with HCU bolting (paragraph 3.b.) and unique breathing air fittings (paragraph 3.c.). The Team was favorably impressed with the capability and enthusiasm of the engineering personnel involved and their strong cooperation with the maintenance organization.

The Team completed additional inspections in two areas of engineering support (duties of systems engineers and DCR prioritization) by review of controlling procedures, discussions with management and engineering personnel and review of documentation.

Findings

The Team identified a lack of procedural definition regarding the duties and responsibilities of systems engineers. Some definition is provided by procedure 10AC-MGR-001-0S, Plant Organization Staff Responsibilities and Authorities. However, this upper-tier procedure does not provide specifics related to systems Engineers.

In some cases, the implementation of Design Change Requests (DCRs) has not been timely. An example is DCR 80-440, "RCIC low speed bypass line" which has been implemented on Unit 2 for several years but is not yet implemented on Unit 1. Implementation was given a low priority since it was considered to have little impact on reliable plant operation. Cognizant licensee personnel provided details on a recently implemented DCR prioritization rationale, the downward trend data for open DCRs (22% reduction since March 1986), and an informal schedule of DCRs recommended for approval in 1990.

Conclusion

The Team concluded that additional specifics regarding systems engineers duties and responsibilities should be added to the procedures involved.

The Team also concluded that the presently implemented DCR prioritization rationale and schedule were sufficient to resolved any NRC concern.

The Team consensus was that technical support could be improved in both program and implementation.

m. Review of Licensee's Service Air System (Breathing Air System)

- Requirements

  Licensee Technical Specification 6.11 states in part that procedures for personnel radiation protection shall be prepared consistent with the requirements of 10 CFR 20, and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure.

  10 CFR 20, Apendix A, footnote (d), requires that respirable air shall be provided of the quality and quantity required in accordance with N1OSH/MSHA certification (described in 30 CFR Part 11) for atmosphere - supplying respirators.

  30 CFR, Part 11, Subchapter b, subparts H and J require that breathing air meet the applicable minimum grade requirements for Type 1 gaseous air set forth in the compressed gas association commodity specification for AIR, G-7.1 (Grade D or higher quality).

  Occupational Safety and Health Administration (OSHA) 1910.134, "Respiration Protection" and NUREG 0041, "Manual of Respiratory Protection Against Airborne Radioactive Materials," include requirements to have air line couplings that are incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with non-respirable gases or oxygen.

ANSI Z-88.2-1969, Practices for Respiratory Protection, Section 5.3, Respirable Air and Oxygen for Self-Contained Breathing Apparatus and Hose Type Respirators, also requires air-line couplings to be incompatible with outlets for other gas sytems to prevent inadvertent servicing of air-line respirators with nonrespirable gases or oxygen.

- Unique Fittings

Observations

The team walked down the system from the air intake to selected systems outlets, and reviewed the following: historical background information for the system; operations procedures for annunciator response and abnormal operating procedure; instrument and service air maintenance; health physics procedures relating to the supplied air respiratory protection program; and calibration records for the system's temperature monitors.

Findings

The licensee documented on Deficiency Card 2-87-659, October 6, 1987, that quick disconnects on the Service Water System outlets were identical to those used on Service Air System outlets. The root cause for the identified deficiency was "No guidance on installation of quick disconnects." The licensee issued guidance on the use of quick disconnects on December 11, 1987. The guidance reported that quick disconnects were used on only the Demineralized Water System (P21), Service Water System (P41), and the Service Air System (P51). The guidance did not address the Instrument Air System (P52).

The licensee issued another Deficiency Card 2-88-1452 on March 16, 1988, identifying a Service Air System fitting on a Demineralized Water System outlet in Unit 2, High Pressure Coolant Injection (HPCI) room. The corrective actions taken referenced the Significant Occurrence Report (SOR) 2-87-659-185 that was written for the previously identified October 6, 1987, finding which was closed in December 1987.

During tours of licensee's facilities on March 3, 1989, the inspectors determined that identical fittings were on the instrument air and service air lines. During the tours, the team requested a health physics technician to accompany them. When the health physics technician was asked which system, instrument air (P52) or service air (P51), should be utilized to supply breathing air, the technician was unsure and reported that he did not know. The service air lines (breathing air lines) were not identified as service air-breathing air outlets as recommended in the REA HT-0718 study in 1981.

Conclusions

The team informed licensee personnel that failure to have incompatible fittings on the Service Air System (breathing air system) was a violation of licensee Technical Specification 6.11 in that the licensee had failed to comply with the implementing references specified in licensee procedure 60AC-HPX-006-0S and that the failure to implement 60AC-HPX-006-0S occurred as a result of inadequate corrective actions for deficiencies identified by the licensee in the HT-0718 study in 1981 and two Deficiency cards (2-87-659 in October 1987 and 2-88-1452 in March 1988). The inspectors stated that failure to take timely and adequate corrective actions to prevent recurrence was a violation of the licensee's quality assurance program Appendix B, Criterion XVI, Failure to Complete Adequate Corrective Action 321,366/89-02-02.

- Failure to Sample the Plant's Breathing A System

Observations

The team determined that licensee procedure 60AC-HPX-006-0S required the licensee to provide Grade D air or better as prescribed by the Compressed Gas Association. The procedure also requires that the respirable air be sampled monthly for radioactivity. The inspectors requested a review of the Grade D and Radioisotopic Analyses made in the last 12 months. Licensee procedure DI-RAD-03-1087N lists the locations and frequencies for each sample. The licensee samples the respirable air systems for Grade D air on a quarterly basis. The team determined that the licensee had completed the monthly isotopic samples for radioactivity as required. However, the licensee could not demonstrate that the Grade D sample on the air compressor utilized to fill Self Contained Breathing Apparatus (SCBA) had been made during the fourth quarter of 1988.

Conclusions

The inspectors informed licensee representatives that failure to take a quarterly air sample and analyze it for Grade D air was a violation of Technical Specification 6.11.

- Procedures for Sampling

Observations

The Team determined that the licensee's radiation protection procedures did not describe how the plant breathing air was sampled and analyzed to verify that the plant breathing air systems meet the minimum requirements for Grade D air. When licensee management was notified that there appeared to be a violation of licensee Tehcnical Specifications, for failure to have written procedures, the inspectors were informed that a site Quality Assurance (QA) Auditor had already identified the procedure problem in an ongoing QA audit. The inspectors interviewed the QA auditor and determined that the auditor had begun a radiation protection program audit March 7, 1989 and had discussed the finding with health physics personnel. The inspectors reviewed a Procedure/Request Development form that had already been completed to address the deficiency. The Team stated that a review of the licensee's corrective actions concerning the sampling and analyses of the plant's breathing air system to meet Grade D requirements would be performed and identified as Inspector Followup Item (IFI) 321,366/89-02-07, Written Procedure for Sampling Breathing Air.

- Breathing Air System Instrumentation

  During the review of Service Air System High Temperature instrumentation, the Team determined that the licensee was verifying correct operability every five years plus or minus five years. The inspectors discussed the calibration frequency with licensee management and licensee representatives agreed to increase the frequency to every 18 months.

n. Radiological Protection Program Interfaces

The Team reviewed the method and degree of interaction between the radiation protection staff and other plant groups. In addition, craft and operations personnel were interviewed relative to support they received from the radiation protection staff and found that in general, there appeared to be a good working relation between the health physics group and other plant sections. The licensee had established a shift coverage schedule, in which, all of the people working rotating shifts did so together. Through interviews with various shift personnel, the inspectors determined that most people interviewed like the idea of working together routinely and thought the schedule enabled the various work groups on a shift to work together more as a team.

The Team determined that the licensee had a radiation specialist assigned to the planning/controls section.

o. Control of Radioactive Material, Contamination, Surveys, and Monitoring

Reviews of records and observations during plant tours revealed no instances in which unsatisfactory controls were being exercised over radioactive material, contamination, surveys or personnel monitoring.

The licensee had made improvements in controlling radioactive materials and in reducing the total area contaminated.

p. Radiation Protection Audits

The Team discussed the audit and surveillance program related to radiation protection and control of radioactive material with licensee representatives and reviewed the following audits:

Quality Assurance Audit of Health Physics Program (88-HP-1)

Quality Assurance Audit of Health Physics (88-HP-2)

The audit findings identified program strengths and weaknesses. Examples of the audit findings documenting program weaknesses included but were not limited to:

Failure to perform adequate surveys
Poor documentation of ALARA activities
Inaccurate man-rem estimates
Inadequate guidance to require ALARA review of plant documents

The audits were gocd health physics appraisals, in-depth, and appropriate in scope. The licensee's audit program for radiation protection activities is a program strength.

q. As Low As Reasonably Achievable (ALARA)

10 CFR 20.1c states that persons engaged in activities under licenses issued by the NRC should make every reasonable effort to maintain radiation exposures as low as reasonably achievable. The recommended elements of an ALARA program are contained in Regulatory Guide 8.8, Information Relevant to Ensuring that Occupational Radiation Exposure at Nuclear Power Stations will be ALARA, and Regulatory Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposures ALARA.

As documented above licensee radiation protection audits had identified needs for improvement in tha ALARA area. Program weaknesses identified included:

Initial man-rem estimates for radiation work permits are inaccurate. Errors in both the projected man-hour and dose estimates have contributed to the problem.

Some aspects of ALARA Program are not well understood by plant personnel.

At the time of inspection, most of the corrective action as a result of licensee audits had not been implemented, however, the licensee was in the process of strengthening its ALARA program. The licensee was reviewing an ALARA training program to give plant workers additional training that would enable the staff to better understand methods to reduce exposures. The licensee was also requiring more involvement from section supervisors in setting ALARA goals and guidelines were being developed to strengthen the Plant ALARA Review Committee (PARC). Implementation of the proposed corrective actions should strengthen the licensee's radiation protection program.

The licensee's 1988 person-rem per unit for Boiling Water Reactors (BWRs) was 701 versus the 1988 national average of 511 person-rem per unit. The licensee's three year average is 619 person-rem per unit versus the national average of 551 person-rem per unit.

r. Maintenance Related Data

Observations

The Team examined the following data associated with maintenance at Plant Hatch. Most of the data showed an improving trend in the years up to 1987. In that year, record performance was achieved for availability factor (over 80%), consecutive days on-line (143), electrical generation (10,832 gigawatt-hours), forced outage rate (3.0%) and industrial safety (10,880,000 man-hou without a lost-time accident). In 1988, as shown in Table 1, most data continued to show acceptable performance and showed improvement over 1986 but in some areas performance was not as good as in 1987. The number of reactor trips and ESF actuations in 1988 were above the industry average, but within the acceptable range.

Table I, Maintenance Related Data

Indicator, both units	1988	1987	1986	1988 Industry Average per unit
Availability Factor, %	63	81	54	77
Forced Outage Rate, %	12.4	3.0	9.3	11
Reactor Trips	10	8	11	2
ESF Actuations	6	5	4	2
TS Violations	24	27	43	
SALP Rating, Maintenance	2	2	2	
LERs	38	27	77	
NPRDS Failure Reports	693	460	173	
Significant Occurrence Reports	534	827	NA	
Work Orders Backlog, 12/31	1259	2400	3144	
Radiation Exposure, Man-rem per unit	383	431	742	521 (1987)
Absenteeism, %	1.8	1.9	2.1	

Conclusion

The Team concluded that although some of the historic data showed poorer performance in 1988 than in 1987, the long-term trend is improving and on balance the data indicate good performance.

s. Root Cause Analysis

The root cause analysis program at Hatch Nuclear Plant was evaluated with respect to training, procedures, and implementation. Interviews were conducted with individuals who were involved in the development of the program and who are currently responsible for its implementation. Specific areas inspected were training materials and their application, procedures, MWOs (2-88-4850, 2-89-65, 2-88-704, 2-88-1810, and 2-88-1788), and significant equipment failures. Additionally, one manager who completed the 40-hour root cause analysis course was interviewed and observed applying principles and techniques covered during the course.

Observations and Findings

During 1988, some managers and engineers received initial training to familiarize them with concepts and methods used to conduct root cause analyses. The methods included MORT, event and causal factors analysis, fault tree analysis, change analysis, barrier analysis, and Kepner Tregoe's problem analysis. The training consisted of an eight-hour course on root cause analysis. The course materials included an instructor handbook (IT-IH-21100-00) and a student text (IT-ST-21100-00).

Currently, a 40-hour course on root cause analysis is taught by EG&G Intertech. This course was introduced December 1988. The course materials also include an instructor handbook and a student text (IT-21300-01). The stated goal is to ensure that about 50 individuals (including engineers, supervisors, manager, general support personnel, security personnel, and maintenance personnel) receive training on root cause analysis. The stated expectation is that about ten new individuals will receive training on root cause analysis each year. Each department nominates candidates for the root cause analysis course.

Hatch Nuclear Plant has several procedures in place to address root cause analysis. Procedure AG-MGR-27-0687N provides guidance for personnel reviewing events necessitating root cause determination. The Team identified a weakness in this procedure concerning the lack of details on how to conduct a root cause analysis. Other procedures relevant to root cause analysis include 10AC-MGR-004-0S, 40AC-REG-002-0S, and 10AC-MGR-012-0S. The first procedure assigns responsibility for root cause determination and provides guidance on identifying significant deficiencies. The determination that a deficiency is significant necessitates a root cause analysis. The second procedure specifies significant events or conditions that require reporting. The third procedure provides specific guidance for addressing significant or repetitive events (or conditions), including the need for root cause determination.

Two approaches were used to assess the actual use of root cause analysis in maintenance efforts at Hatch Nuclear Plant. In the first approach, several pieces of equipment that had been previously judged as having significant failures were the focal point. These significant equipment failures were investigated to determine if root cause analyses were completed as required. The pieces of equipment were: 2E41-F006 (HPCI pump discharge valve), 2E51-F008 (RCIC Steam Isolation Valve), 2B31-R620 (master recirculation controller), 2B21-F013H (safety relief valve), 2B21-F022B (air valve), and 2B21-F022C (air valve). For all of the equipment failures except one, it was found that root cause analyses had been completed and were considered adequate. However, no root cause analysis was conducted for valve 2E51-F008.

In the second approach, an individual was identified who had not only completed the 40-hour root cause analysis course, but also was attempting to determine the cause of a failed pump. This individual described and demonstrated principles and techniques taught in the course that were being applied to the failed pump problem. The observed process was considered adequate and seemed to reveal some insights on the "weight" that should be given to vibration, oil, and wear-particle analyses.

One procedural weakness was noted regarding procedure AG-MGR-27-0687N. The procedure lacks details on how to conduct a root cause analysis. The Team further observed that an excessive length of time was required to determine root cause of Feedwater Pump leakage discussed in paragraph 4.x.

Conclusions

The root cause analysis program regarding maintenance at Hatch Nuclear Plant was adequately documented and seemed to be well implemented. However, weaknesses were noted as discussed above. Overall, the program was judged satisfactory.

t. Trending

The trending program at Hatch Nuclear Plant was evaluated regarding established procedures and program implementation.

Observations and Findings

Hatch Nuclear Plant has two procedures in place to address trending in the area of maintenance. The first procedure, DI-MNT-02-1085N, is concerned with repetitive maintenance problems (for example, repeated failure of the same piece of equipment) and is applicable to maintenance engineering personnel.

Trends were investigated for the main steam (B21) recirc (B31), CRD filters (C11), HPCI (E41), and RCIC (E51), regarding equipment with equal to (or greater than) five corrective work orders for the period January 1, 1988 to December 30, 1988. The equipment considered was as follows: 2B21-F002A (4-way air valve), 2B21-F022B (2-way air valve), 2B21-F022C (3-way air valve), 2B21-R614 (SRV temperature recorder), 2B31-S001A and B (Recirc M-G Sets), 2C11-R003B (CRD Filters), 1E41-F002 (HPCI Steam Supply Isolation Gate Valve), 1E41-C001 (HPCI Main and Booster Pump), 2E51-F007 (RCIC Steam Supply Isolation Valve), 2E51-F045 (RCIC Steam Turbine Valve), and 1E51-F045 (RCIC Steam Turbine Valve).

The Team found that trend data for the equipment provided useful information and except for the CRD Filters, the data indicated that the subject equipment failed for a different reason each time. The systems engineer pointed out that the problem with the high CRD filter replacement rate during March 1988 on Unit 2 was found to be related to start-up from a refueling outage. CRD takes suction from the condensate system (carbon steel pipe). After a unit has been shutdown two to three months, corrosion builds up in the condensate system causing CRD filters to need replacing more often after an outage.

The second procedure, DI-REG-08-1285N, describes the trending program for deficiency cards (DCs), significant occurrence reports (SORs), and licensee event reports (LERs). The trend report for DCs and SORs covering the period January 1, 1988 to December 31, 1988 was examined. The equipment included the following: 1C11-R018 (CRD temperature recorder), 1N21-C007 (condensate demineralizer pump), 2W24-C021 (cooling tower fan), and 2N21-C002A (condensate booster pump). It was found that the trend report was both adequate and comprehensive, including a detailed breakdown of the type of deficiency (e.g., personnel related).

Although not explicitly covered by procedures DI-MNT-02-1085N and DI-REG-08-1285N, trending of NPRDS equipment failures were also investigated. The NPRDS equipment failure analysis report for the period January 1987 to June 1988 was examined. In addition to review of the NPRDS report, a summary description was reviewed of all MWOs for all systems with NPRDS component failure from January 1, 1988, to December 30, 1988. The failed equipment included the following: CRD-N26-23 (control rod), B31-K634A (controller), C11-R601 (pressure indicator), C32-R607 (flow recorder), C32-K6008 (amplifier), B31-N014D (transmitter), E11-C001A (pump), and B21-F010A (valve). The subject trend report was considered a definite strength to the overall Hatch Nuclear Plant trending program because it not only provided useful data on specific equipment that had failed, but also provided comparisons with the industry average.

Trends were investigated for the main steam (B21) recirc (B31), CRD filters (C11), HPCI (E41), and RCIC (E51), regarding equipment with equal to (or greater than) five corrective work orders for the period January 1, 1988 to December 30, 1988. The equipment considered was as follows: 2B21-F002A (4-way air valve) 2B21-F022B (2-way air valve), 2B21-F022C (3-way air valve), 2B21-R614 (SRV temperature recorder), 2B31-S001A and B (Recirc M-G Sets), 2C11-R003B (CRD Filters), 1E41-F0C2 (HPCI Steam Supply Isolation Gate Valve), 1E41-C001 (HPCI Main and Booster Pump), 2E51-F007 (RCIC Steam Supply Isolation Valve), 2E51-F045 (RCIC Steam Turbine Valve), and 1E51-F045 (RCIC Steam Turbine Valve).

The Team found that trend data for the equipment provided useful information and except for the CRD Filters, the data indicated that the subject equipment failed for a different reason each time. The systems engineer pointed out that the problem with the high CRD filter replacement rate during March 1988 on Unit 2 was found to be related to start-up from a refueling outage. CRD takes suction from the condensate system (carbon steel pipe). After a unit has been shutdown two to three months, corrosion builds up in the condensate system causing CRD filters to need replacing more often after an outage.

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Interviews with maintenance management revealed that functional (or post maintenance) test data are trended to identify any adverse trends. The team pointed out to the licensee that trending NPRDS data with respect to failed components that can be attributed to personnel error during previous maintenance is another trend that is recommended. This trend is readily available and could serve to augment functional test trends.

Conclusions

The Hatch trending program in the area of maintenance was satisfactorily documented through procedures and appeared to be well implemented. The overall program was judged "good." This judgment was based on adequate procedures that were in place and appropriate implementation of the program. One recommendation for enhancing the trending program was noted. The recommendation concerned trending NPRDS data regarding failed components that can be attributed to previous maintenance. The benefits of such a trend would be two-fold: to augment trend data on functional tests and to identify any adverse trends in this area.

u. Spare Parts

During the inspection, two MWOs were identified that required spare parts for final resolution. The first MWO, 2-89-00536, concerned obtaining a motor for the MSIV leakage control system. The second MWO, 1-88-8411, involved obtaining a backup battery for the programmable controller in the demineralizer building.

Observations and Findings

The resolution of the spare part issue for the MSIV system was evaluated by monitoring morning management sessions and interviewing the maintenance manager concerning this issue. There was some difficulty in obtaining a spare motor because the manufacturer is no longer in business. During the week of March 6, the motor arrived at the plant and was installed, returning the MSIV system to operability and thereby resolving a LCO. Currently, the motor that failed is being refurbished and will serve as a spare. The maintenance manager indicated that parts that are no longer manufactured are a problem for Hatch Nuclear Plant and the industry at large. He also noted that the corporate office is supportive in resolving issues of this kind.

The second MWO, 1-88-8411, concerned obtaining a backup battery for the programmable controller in the demineralizer building. The technician who replaced the battery indicated that the subject battery was ordered and promptly received.

Conclusions

The resolutions of the above described spare part issues were considered good based on the continuous attention given by plant and corporate management to obtain the spare motor and the prompt acquisition of the backup battery.

v. Document Control System for Maintenance

The document control system for maintenance utilized at Hatch Nuclear Plant was evaluated with respect to these criteria: established, proceduralized, maintained, traceable, and updated.

Observations and Findings

The Nuclear Plant Management Information System (NPMIS) has been established, maintained, and is continuously updated, providing a computer-based control system for processing MWOs. Procedure DI-OAP-10-0588N provides guidance for processing MWOs. Specific MWOs that were examined (that is, from initiation to closeout) through the NPMIS included the following: 1-88-01297 (failed SRV temperature recorder), 2-87-03973 (replaced ASCO solenoid valve), 2-88-02235 (valve failed to close), and 2-88-02240 (valve air leak). It was found that MWO history and status are easily traceable through the NPMIS. Since the plant does not employ a "trouble tag system", checks were made to ensure that the NPMIS included MWOs for failed equipment that was observed during plant walkdowns. With some exceptions, it was confirmed that the NPMIS did include the subject MWOs. Numerous NPMIS computer terminals were located throughout the plant in areas that seemed convenient for management, system engineers, maintenance engineers, and support personnel.

Conclusion

The NPMIS was an effective system for not only documenting the history and status of maintenance on equipment but also for trending failed equipment. Based on the above findings and observations, the system was judged "Good".

w. Control Room Annunciator Alarms

Control room annunciator alarms were evaluated for both Units 1 and 2 regarding the number of annunciators that are continuously lighted and whether annunciators that should be cleared are being addressed by the maintenance program.

Observations and Findings

The control room was inspected on two different occasions. During the inspections, it was noted that only a few annunciators were continuously lighted. Of these annunciators, the SAFETY/BLOWDOWN VALVE LEAKING annunciator, was investigated to determine how it was being resolved. It was determined that the annunciator was in alarm resulting from a problem in the drywell. The problem was scheduled to be fixed during the next forced outage. During the daily morning management meetings, the number and causes of lighted annunciators were discussed. On February 28, 1989, the following annunciators were reported: 1H11-P651, COOLING TOWER OR DEEP WELL PUMP BKR TRIPPED (several cooling tower fans tripped locally); 1H11-P700, WGT BLDG CHILLER B TROUBLE (blown gasket); 1N62-P600, ABSORBER VESSEL TEMP HIGH (MWO 1-89-912); 2H11-P657 and 2H11-P654, TORUS WATER HI/LOW LEVEL (due to venting with low level present); and 2H11-P700, REAC/RADW BLDG COOLING TOWER BASIN HIGH LEVEL (operations investigating and deficiency card written).

Conclusion

Based on the above findings and observations, the number of continuously lighted annunicators were judged to be few and the subject annunciators appeared to be adequately addressed.

x. Condensate and Feedwater System (N21)

Observations

The Team inspected maintenance activities on the N21 system. The inspection included examination of a Summary List of 75 MWOs related to repetitive corrective maintenace and 75 MWOs related to NPRDS equipment failures. Each of these MWOs was discussed with the cognizant system engineer and a walkdown of the system, with emphasis on the items requiring repeated corrective maintenance, was conducted with the system engineer.

Findings

- Repetitive Tracking System

  The system for tracking repetitive equipment failures was developed by the Maintenance Engineering Supervisor to provide guidance for prioritizing corrective maintenance work. The tracking system uses the NPMIS to sort those Master Parts List (MPL) items for which five or more MWOs for corrective maintenance (CM) were written in 1988. This list provided a method for team inspectors to focus inspection effort on those MPLs with potential maintenance problems.

For the Condensate and Feedwater System (N21), the following MPL's were listed:

MPL Number	Number of MWOs	Description
1N21 B006a	5	5th Stage Extraction Heater A
1N21 B006B	5	5th Stage Extraction Heater B
1N21 C005A	11	Reactor Feedwater Pump and Turbine A
1N21 C005B	10	Reactor Feedwater Pump and Turbine B
1N21 P001	17	Condensate Polisher Control Panel
2N21 C002A	7	Condensate Booster Pump
2N21 C005A	9	Reactor Feedwater Pump and Turbine A
2N21 C005B	11	Reactor Feedwater Pump and Turbine B

- Feedwater Pump Leaks

During the system walkdown, sizable seal leaks were noted on the shafts of each of the four feedwater pumps. A tray to catch this water was installed below each pump with a drain tube to a 50-gallon drum. A drain tube lead from the bottom of the drum to the floor drain. Drain tubes also lead from the seal weep holes to the 50-gallon drum. Plastic funnels were installed to catch leak water from flanges and fittings on pipes in the feedwater pump rooms. Drain tubes from the plastic funnels lead to floor drains.

The seal leakage observed was not considered to be normal and a consultant from the pump vendor (Byron-Jackson) was called in on March 6, 1989, to analyze the problem. According to the vendor representative the root cause of the problem was that the normal seal water flow was routed back to the condenser hot well rather than to the booster pump intake. The low pressure in the hot well caused the seal water to flash into vapor, thereby restricting liquid flow to the hot well. The vendor representative suggested that the excessive leakage could be decreased by rerouting the seal water flow to the booster pump intake or by increasing the size of the piping. Until these design changes are made, the leakage may be decreased by careful adjustment of the seal water controls.

- Rebuild of Condensate Pump

The Team examined documentation associated with the repair of Unit 2 condensate pump N21-C001B. The complete work order packages for the first and second rebuilds of the pump were obtained. MWO 2-88-1906 was written on April 5, 1988, when high vibration was noted and the pump shaft appeared to be out of alignment. Worn bearings and wear rings on the pump shaft were found. The pump shaft and bearings were replaced. MWO 2-88-3177 was written on July 6, 1988, when the pump failed again shortly after startup following the first rebuild. The lengthy MWO packages (55 pages for the second rebuild) did not provide a clear picture of the root cause of either failure nor of the actual repair operations.

A further explanation was provided by the maintenance manager. After the first failure of the pump, cracks were noted in the section of the pump casing (52" in diameter and 104" long) containing the suction and discharge flanges. This casing section was rebuilt. The root cause of the second failure was that the flanges for attaching the new casing section to the motor and to the pump casing section were not properly aligned, because instruments were not available in the maintenance shop for accurately aligning such large-sized sections of casing.

When it was deduced by the maintenance manager that alignment was the problem, special equipment was designed and built for checking the alignment of the casing flanges. The flanges were found to be out of line. The alignment was corrected and the pump was reassembled. It has been running without problems since September 1988. The Team observed this pump in operation with a maintenance engineer familiar with checking vibration and alignment. Wire leads from the pump shaft bearing area for attachment to a vibration measuring instrument were visible. The pump appeared to be running smoothly.

A representative of the pump vendor was present during the first and second rebuilds of the pump. The representative did not recognize the alignment problem with the first rebuild and was surprised by the subsequent failure.

Conclusions

- Repetitive Tracking System

  The Team consensus was that the NPMIS and repetitive tracking system is a programmatic strength (also see paragraph 4.v above).

- Feedwater Pump Leaks

  The temporary provisions to route the seal water leaks, and other pump room leaks, to the floor drains are unsightly and constitute poor housekeeping practice, but do not represent significant contamination or safety hazards. The pump room leaks, except the seal leaks, will be corrected at the next outage. Hatch management is moving toward a long-term solution of the seal leak problems along the lines suggested by the pump vendor representative. No definite schedule for corrective action has yet been established. Ideally, the licensee should have discovered the root cause of the leakage and corrected it sooner, but the delay has not interfered with system operation nor resulted in a safety hazard.

- Rebuild of Condensate Pump

The Team consensus was that the condensate pump rebuild indicated a strong plant maintenance organization able to analyze and correct a subtle and complex maintenance problem. However, the poor description of the root cause analysis and corrective actions in the two "rebuild" MWOs is considered to indicate a weakness of the licensee's record keeping in the maintenance area.

5. Evaluation of Maintenance Program

Based on the inspection details and inspection results of paragraphs 3 and 4 above, the team evaluated the Maintenance Program using the guidance of NRC TI 2515/97. The below paragraphs detail the evaluation.

a. Overall Plant Performance Related to Maintenance - Direct Measures

Rating - Good

Findings/Observations

Review of Direct measures revealed an improving trend of most performance indicators up to 1987. In that year, record performance was achieved for availability factor (over 80%), consecutive days on-line (143), electrical generation (10,832 gigawatt-hours), forced outage rate (3.0%) and industrial safety (10,880,000 man-hours without a lost-time accident).

Although some of the historic data showed poorer performance in 1988 than in 1987, the long-term trend is improving and on balance the data indicate good performance.

The general plant walkdowns found the plant to be in relatively good material condition and the team consensus was that the general quality of housekeeping in the plant was good. As noted in paragraph 4.a., some deficiencies were identified. On balance, the team does not regard the noted deficiencies as significant and considers the overall condition of plant and housekeeping to be good.

Conclusion

The overall plant performance related to maintenance as indicated by historic data and observed in plant walkdown inspections is good.

b. Management Support of Maintenance

Rating -

Program: Satisfactory

Implementation: Satisfactory

Scope

Management support of maintenance was examined by reviewing and evaluating (1) management commitment to and involvement in maintenance; (2) management organization and administration; and (3) technical support provided to the maintenance organization.

(1) Management Commitment and Involvement

Rating

Program: Good

Implementation: Good

Findings/Observations

In general, the team found, during the inspections detailed in paragraph 4. above, that the licensee had a good program for application of industry intiatives. The inspection revealed the following examples of good application of industry initiatives: few control room annunciator alarms that are continuously lighted; the NPRDS is used for trending and equipment failure history; motor operated valve motor shaft keys are being replaced; backseating of valves is no longer done on a routine basis (IN 87-40); policy has been established to remove PCBs from 4160-600V transformers by retrofilling with non-PCB insulation; checks for silicon bronze carriage bolts (IN 88-11) in equipment identified in the IN as well as other related equipment (e.g., 5KV switchgear).

The following weaknesses were identified relative to application of industry initiatives: Information Notice 88-42, "Circuit Breaker Failures Due to Loose Charging Spring Mounting Bolts," was not incorporated into the preventive maintenance procedure; the duties and responsibilities of the "systems engineer" is not well defined; and the vendor's recommendation regarding PM on

4KV switchgear was not followed. The sytems engineer-related and switchgear-related weaknesses are discussed further in paragraphs 4.1. and 3.a., respectively.

Investigation of management vigor and example indicated the following: management performs systematic area inspections; various morning meetings conducted by upper management serve to identify important maintenance issues, followed by meetings with departmental managers and foremen to resolve the identified issues; training is generally excellent except that PM training on 4KV switchgear is not yet complete; and feedwater flow system maintenance replacing GEMAC transmitters indicate that plant aging is being addressed. The latter finding is discussed further in paragraph 4.c.

Conclusion

Based on management's commitment to the application of industry initiatives, as noted above, and observation of management's clear and active involvement in the maintenance program both the program and its implementation were rated "good." Weaknesses in this inspection area were noted regarding IN 88-42, the vendor recommendation on 5KV switchgear, and incomplete PM training on 5KV switchgear.

(2) Management Organization and Administration

Rating -

Program: Not Evaluated

Implementation: Good

Findings/Observation

Maintenance staffing level seemed adequate, including the amount of technical support provided; no adverse indicators of material problems were found in the MWO review; various types of maintenance activities (e.g., ISI, surveillance testing, diagnostic, preventive, predictive, and corrective) have been implemented in the maintenance process; walkdown inspections are completed by management (e.g., Maintenance Superintendent and Plant Engineering Supervisor); daily feedback is provided through morning meetings and staff meetings regarding maintenance issues where improvement is needed; numerous performance measurements (e.g., backlogs, reworks, and deferrals) are well identified and implemented; and plant management appeared to be involved in and aware of decisions regarding upgrades, plant aging, and work deferment.

The computer-based maintenance work order system was well implemented and judged to be a definite strength to the overall maintenance program. Specific strengths included (a) the capability to trend repetitive equipment failures (b) the MPL numbering system, and (c) the availability of numerous CRT terminals. This system is discussed in further detail in paragraph 4.v.

Relative to definition of maintenance requirements, a weakness was identified in that the licensee was not following the vendor technical manual regarding PM on 4KV switchgear (see paragraph 3.a). Additional weaknesses were identified relative to root cause analyses. The first concerned a feedwater pump seal leak and the length of time required to determine the cause of the excessive leakage (See paragraph 4.x.). The second involved a MOV motor failure where root cause was not anlayzed (MWO 2-88-02612). Root cause analysis is discussed further in paragraph 4.s.

Conclusion

Based on the above inspection findings, management organization and administration was rated "Good." Some needed improvements in this inspection area were noted with respect to following vendor technical manuals and conducting root cause analyses. The program for this inspection area was not reviewed in sufficient detail and, therefore, it was rated "Not Evaluated."

(3) Technical Support

Rating -

Program: Satisfactory

Implementation: Satisfactory

Findings/Observations

Formal and informal communication between technical support and other organizations were not examined in detail. However, indications are that communication is strong. Maintenance information is communicated in the daily 7:30 AM meeting to discuss the five principal operations to be performed that day. A weekly meeting projects maintenance work to be done in the next two weeks. These meetings are attended by about 30 maintenance, support and supervisory personnel including the plant manager.

Good communication between maintenance craftsmen, their foreman and other support personnel was observed during the performance of several maintenance jobs.

Examination of Engineering Support revealed that: the major engineering support for maintenance at Hatch comes from the maintenance engineering group reporting to the maintenance manager for engineering support. The maintenance engineering group resolves routine engineering problems related to maintenance, monitors preventive and predictive maintenance, and performs trending analyses on repetitive failures and on the ratio of preventive to total maintenance. Less routine maintenance problems are sent to the system engineers for analysis and resolution.

Maintenance engineers appear to be competent and enthusiastic in completing their assigned tasks. The Team also interacted with system engineers during this inspection. It was clear that the system engineers were thoroughly familiar with the maintenance problems of their assigned systems and took active part in their resolution. However, a need for better definition of systems engineers duties and responsibilities was identified.

Examination of QC revealed that: criteria for inspection and audit are established and implemented, inspection/verification is scheduled and accomplished, and corrective actions are taken as necessary. The Team noted that plant QC inspectors were present during the performance of maintenance and that MWOs specified holdpoints for QC checks. In one instance, the QC inspector miscalled the acceptability of a faulty weld patch operation (see pragraphs 3.e. and 4.k.). Overall, this element is rated good in program and implementation.

Radiological controls were examined and found satisfactory with exception of procedures related to breathing air sampling (see paragraphs 3.d. and 4.m.)

Examination of maintenance safety revealed that: some electrical procedures lacked sufficient safety instructions, although the electricians actually observed good safety precautions in performing their work. However, a violation involving breathing air was noted by the Team. Safety codes require the use of unique fittings on breathing air lines to preclude non-respirable gas. The same type of fitting was observed on instrument air lines subject to nitrogen use.

No deficiencies were observed involving hazardous materials, fire protection or confined spaces.

The integration of regulatory documents was examined and two related violations noted. First, loose bolts were observed on CRD Hydraulic Control Units (related to regulatory documents IN 87-56 and violation 321/86-20-02) (see paragraph 3.b.). Second, an inadequate procedure for insuring incorporation of vendor information into procedures was identified (related to regulatory document Generic Letter 83-28) (see paragraph 3.a).

Conclusion

Based on the inspections and findings summarized above, the consensus of the team for the Technical Support element is that both the program and its implementation are satisfactory.

c. Maintenance Implementation

Rating -

Program: Good

Implementation: Good

Scope

The purpose of this part of the inspection was to determine the quality of the established controls and, more importantly, the implementation of these controls. The controls established in four areas were evaluated. These areas are (1) Work Control, (2) Plant Maintenance Organization, (3) Maintenance Facilities Equipment and Materials Controls, and (4) Personnel Control. The effectiveness was determined through a review of completed work orders, procedures, and other documentation associated with maintenance and training of maintenance personnel; physical observation of work in progress and tools in stock; and discussions with all levels of personnel.

(1) Work Control

Rating -

Program: Good

Implementation: Good

Findings/Observations

Review of work in progress in the field indicated that appropriate authorizations were received; proper documentation was issued; foremen observe the work in progress; personnel appear competent and properly qualified; procedures were followed; and no major problems were identified during the observation of work. However, a concern was identified regarding lack of precise definition/details on MWOs 2-88-4862, 2-88-1906 and 2-88-3177.

This was aggravated by an error regarding the type of post-maintenance testing required after revision of MWO 1-89-00722 on station service battery charge 1D. These weaknesses are further discussed in paragraphs 4.e.(7), 4.x. and 4.e.(1)., respectively.

Examination of the work order control system revealed a program in place to identify discrepancies - the Nuclear plant Management Information System (NPMIS). NPMIS is routinely updated by planner/schedulers during the MWO review and approval cycle (see procedures DI-OAP-10-0588N and 50AC-MNT-001-0S) and is an excellent tool for the analysis/trending/history of maintenance activities. The NPMIS is further discussed in paragraph 4.v.

Review of equipment and maintenance history records indicated: maintenance history is easily retrievable through NPMIS; work history is updated at the completion (closure) of the MWO, the Master Parts List (MPL)/Equipment Locator Index (ELI) is being updated and expanded; repair time is tracked for each MWO; root cause analysis could be improved (see paragraph 4.s); NPRDS is used but not to the extent to yield maximum benefit (see paragraph 4.t.) and the MWO data form includes an input for NPRDS. On balance, the Team considered the equipment and maintenance history records program to be a strength.

An inspection of the conduct of job planning revealed: the safety significance of an item to be repaired/replaced is the first consideration; LCO items are worked until completion; drawings/technical manuals/procedures are included on the MWO; the planner coordinates work between disciplines on a MWO; spare parts are identified on the MWO, when possible; personnel requirements/qualifications are well documented and are known or easily available to the foreman assigning work; and program/procedures promote coordination and teamwork with system Engineering/Technical Support.

Examination of the licensee's work prioritization controls revealed that safety significance and the effect on safety by BOP is considered and no safety significant items were found that were not included in the work schedule.

By review of the licensee's maintenance work scheduling, it was determined that: the maintenance backlog is being trended and this backlog appears to be decreasing; personnel are organized in teams and rotated between day and night shifts so that new personnel are evenly dispersed and compensation occurs for work loads in the various areas; the planning and control group of the outage and planning department determines the schedule for maintenance (except emergency maintenance) to reduce conflicts and the NPMIS provides for MWO tracking.

The licensee's establishment of backlog controls was reviewed and it was determined that PM maintenance activities are sometimes deferred based on "sufficient written technical basis for the deferral "(see procedure 50AC-MNT-007-0S). The Team examined several of these deferred PMs and noted that the majority were assocated with complex and expensive PMs on rotating equipment (examples: RHR pump motors 1A and 1D and makeup wate pump 1A) which were authorized after an engineering analysis of other predictive maintenance data (i.e. vibration, lubrication, etc.). The Team concluded that deferred PM's were not adversely affecting backlog controls. Backlog controls appear to adequately acknowledge work significance, BOP concerns, estimated manhours, and contribution to ALARA. Backlogs are measured and trended, considered to be below industry average, and receive adequate attention from plant management. The Team consensus was that backlog controls were a programmatic strength.

An examination of maintenance procedures revealed that procedures are generally well conceived, thorough, technically adequate and easy to use. However, some procedural problems were noted regarding adequate tie with Section XI requirements, conduct of root cause analysis, and 4160 Volt switchgear PMs. These are further discussed in paragraphs 3.f., 4.s., and 3.a., respectively.

The Team consensus regarding maintenance procedures was that some improvements were necessary in this area.

An examination of post-maintenance testing revealed that post-maintenance testing criteria have been established, documented and implemented. However, the Functional Tests recommended by procedure 95IT-OTM-001-OS are directed toward component post-maintenance testing and do not necessarily assure operational readiness. The operations supervisor on shift (OSOS) and shift supervisor (SS) review the MWO and may accept the FT as a satisfactory method of proving operability or may require additional operability testing. The Team did not consider the above aspects of the post-maintenance testing program to be of concern. However, the Team observed at least one instance of incorrect functional testing after revision of MWO 1-89-00-00722 (see paragraph 4.e.(1)) and identified the need for programmatic assurance in procedure 50AC-MNT-001-0S that post-maintenance tests as required by ASME, Section XI, are correctly imposed. These items are further discussed in paragraphs 4.e.(1) and 3.f, respectively. The Team consensus regarding post-maintenance testing was that some improvements were necessary in this area.

The Team reviewed a sample of completed work control documentation as listed in Appendix B. This examination established that a document review methodology is implemented and performed in a timely manner. No major anomolies/discrepancies were identified.

Conclusion

Based on the inspection above, the consensus of the team, for this element was that the program and implementation were rated good.

(2) Plant Maintenance Organization

Rating -

Program: Good

Implementation: Good

Findings/Observations

The review of the control of Mechanical, Electrical, and Instrumentation and Control maintenance activities revealed that a methodology has been established and implemented to identify the need for maintenance and control rework, vendor technical manuals, procedures, materials, tools and personnel. Items such as assurance of system integrity, monitoring, use of qualified parts, and personnel accountability are included. The Team noted general positive conditions such as: small work backlogs; PMs according to schedule; improving trends on rework items; use of appropriate procedures; acceptable to good equipment condition; and enthusiastic and well trained personnel. Additional specific areas examined are as follows:

- Mechanical - work histories for several major components (e.g. Unit 2 A and B Recirc M-G Sets, Unit 1 HPCI Main Pump and Steam Supply Isolation Gate Valve, Units 1 and 2 RCIC Steam to Turbine Valves etc. (See paragraph 4.t.)) were reviewed in detail. No major discrepancies were identified with one exception (failure to conduct a root cause analysis after motor failure of RCIC Steam Supply Isolation Valve MOV 2E51-F008). The Team also noted that an undue length of time was required to reach an accurate root cause analysis of Feedwater Pump excessive seal leakage. No major repetitive failures were identified with exception of multiple failures of CRD filters. These were adequately explained as futher discussed in paragraph 4.t.

- Electrical - Review of work history reports (4KV) and special historic trend reports indicated that repetitive failures were not a problem. Further, the licensee trends the condition of station batteries (not a Technical Specification requirement). However, the Team identified weaknesses in that:

  - testing of the overcurrent characteristic of molded-case circuit breakers is not done (except for penetration circuits)

  - preventive maintenance on 4KV switchgear is not adequate since all vendor recommendations are not incorporated into PM procedures (See paragraph 4.a. for details)

- Instrumentation and Control - The Team noted a weakness in the control of calibration of measuring and test equipment. The control is accomplished by a manual, monthly review of equipment calibration cards. The computerized I&C Automated Tracking System for Measuring and Test Equipment was said to be deficient in that it counted 30 days only in each month and caused calibration dates to vary by three to four days. This program should be corrected and the card system used as a backup. However, no specific problems were identified associated with the manual system.

The licensee's deficiency identification and control system was reviewed. During plant walkdown inspections, only minor deficiencies were found (see paragraph 4.a.) which were not previously identified in an MWO. The deficiency identification and control program was considered to be a strength.

The Licensee's performance trending was examined and the determinations were: (1) root cause analysis is adequate but should be improved; (2) performance indicators are trended and the majority were found to be better than industry standards. These were in overtime work, percentage of non-outage MWOs greater than three months old; the ratio of highest priority non-outage corrective MWOs to total non-outage MWOs and overdue PMs.

Other trend information examined included: deficiency cards, LERs, SORs and NPRDS failed components. The Team identified no discrepancies in the above but does recommend the augmentaion of the presently conducted functional test trending with information from NPRDS (See paragraph 4.t.).

The Team consensus was that performance of maintenance trending could be improved, especially with regard to root cause analysis.

The support interfaces were reviewed and noted to be strong. The Team noted good cooperation between maintenance and other organizations. Daily and long term planning meetings appeared to be a strong point. However, the Team identified a lack of procedural definition regarding the duties and responsibilities of systems engineers. Procedure 10AC-MGR-001-0S provides some definition but is not specific to systems engineers. The Team consensus was that this level of definition should be added to the program.

Conclusions

Based on the inspection above, the consensus of the team for this element was that the program was rated good and the implementation was rated good.

(3) Maintenance Facilities, Equipment and Materials Control

Rating -

Program: Good

Implementation: Good

Findings/Observations

The Team found the following: maintenance facilities were located as efficiently as possible; maintenance supervisors' offices were located close to the shops; maintenance shops appeared to have most tools required for the work performed; and parts and tools storage and requisitions was well organized and calibration activities efficiently completed (with exception of the weakness in calibration activities as discussed in paragraph 5.c.(2) above); staging and laydown areas were adequate (with exception of one area in the Unit 1 turbine building); rigging and scaffolding were adequate; training and mockup facilities appeared adequate; and the "Hot" and "clean" machine shops are considered programmatic strengths. These are discussed further in paragraph 4.g.

Conclusions

The Team consensus was that the program and implementation for this area was rated good.

(4) Personnel Control

Rating -

Program: Good

Implementation: Good

Findings/Observations

Observations of in-process work and discussions with craft personnel indicated that the electrical, I&C, and mechanical journeymen were knowledgeable and well trained for their jobs. Training is discussed futher in paragraph 4.h. Staffing for craft personnel was considered adequate. Overtime work was maintained within reasonable limits. The morale and atmosphere of teamwork displayed by craft personnel was considered above average and is reflected in low turnover. Maintenance management is considered qualified, enthusiastic and instrumental in maintaining the teamwork displayed by craft.

Discussion with supervisors indicated that the maintenance training program was in accordance with INPO requirements. Craftsmen were not "grandfathered", but interim qualifications were maintained until formal training could be scheduled. Craftsmen unable to satisfactorily complete the formal qualification requirements are considered not qualified for the area of concern.

However, the training department did not provide any training for performing preventive maintenance of 4KV switchgear. At the time of this inspection, a lesson plan for this was being developed as part of the phase V of INPO training program. This omission was considered to be a fault, but training overall was considered a programmatic strength.

System Engineers have 13-week Engineer-in-Training Systems Course with four days per year followup. This was considered to be adequate. However, as previously discussed, there is need for improved definition of the duties and responsibilities of sytems engineers and additional training may be required.

Conclusion

Based on the inspection above, the team rated personnel control "good" in both program and implementation.

6. Exit Interview

The inspection scope and results were summarized on April 4, 1989, with those persons indicated in paragraph 1. The team leader described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

(Open) Violation 321,366/89-02-01, Inadequate Administrative Procedure - Paragraph 3.a.

(Open) Violation 321,366/89-02-02, Failure to Complete Adequate Corrective Action - Paragraphs 3.b. and 3.c.

(Open) Violation 321,366/89-02-03, Failure to Take Breathing Air Samples - Paragraph 3.d.

(Closed) Violation 366/89-02-08, Failure to Follow Acceptance Criteria for Weld Patch on Reactor Building Roof Drain - Paragraph 3.e.

(Open) IFI 321,366/89-02-04, Programmatic Link Between Maintenance Procedures and ASME Section XI Requirements - Paragraph 3.f.

(Open) IFI 321,366/89-02-05, Inspection of RHR Hanger Weld Removal - Paragraph 3.g.

(Open) IFI 321,366/89-02-06, Design Verification of Containment Isolation Valves T48-F310 and T48-F311 - Paragraph 3.h.

(Open) IFI 321,366/89-02-07, Written Procedure for Sampling Breathing Air - Paragraph 3.i.

7. Acronyms and Initialisms

ALARA	-	As Low As Reasonably Achievable
ANI	-	Authorized Nuclear Inspector
ANII	-	Authorized Nuclear Inservice Inspector
ASME	-	American Society of Mechanical Engineers
BOP	-	Balance of Plant
B&PV	-	Boiler and Pressure Vessel Code
BWR	-	Boiling Water Reactor
CRD	-	Control Rod Drive
CM	-	Corrective Maintenance
DC	-	Deficiency Card
DCR	-	Design Change Request
ELI	-	Equipment Locator Index
FT	-	Functional Test
GE	-	General Electric
GL	-	Generic Letter
HCU	-	Hydraulic Control Units
HP	-	Health Physics
HPCI	-	High Pressure Coolant Injection
IAS	-	Instrument Air System
I&C	-	Instrumentation and Control
IFI	-	Inspector Followup Item
IN	-	NRC Information Notice
INPO	-	Institute of Nuclear Power Operations
ISI	-	Inservice Inspection
LCO	-	Limiting Condition for Operations
LER	-	Licensee Event Report
LLRT	-	Local Leak Rate Test
LPCI	-	Low Pressure Coolant Injection
MCC	-	Motor Control Center
M-G	-	Motor Generator
MPL	-	Master Parts List
MSIV	-	Main Steam Isolation Valve
MT	-	Magnetic Particle Test
MWO	-	Maintenance Work Order
NDE	-	Nondestructive Examination
NPMIS	-	Nuclear Plant Management Information System
NPRDS	-	Nuclear Plant Reliability Data System
OSOS	-	Operations Supervisor on Shift
PARC	-	Plant ALARA Review Committee
PM	-	Preventive Maintenance
PPM	-	Parts Per Million
PRA	-	Probabilistic Risk Assessment
PSIG	-	Pound Per Square Inch Gage
PT	-	Liquid Penetrant Test
PT	-	Potential Transformer
QA	-	Quality Assurance
QC	-	Quality Control

R&R	-	Repair and Replacement
RCIC	-	Reactor Core Isolation Cooling
RHR	-	Residual Heat Removal
SALP	-	Systematic Assessment of Licensee Performanct
SCBA	-	Self Contained Breathing Apparatus
SER	-	Safety Evaluation Report
SIL	-	Service Information Letter
SOR	-	Significant Occurrence Report
SOER	-	Significant Operating Experience Report
SS	-	Shift Supervisor
SSAC	-	Station Service Air Compressor
TI	-	Temporary Instruction
UVTA	-	Undervoltage Trip Attachment
W	-	Westinghouse Electric Corporation

APPENDIX A

LIST OF LICENSEE PROCEDURES REFERENCED/REVIEWED

PROCEDURE NUMBER	TITLE
52PM-X43-006-1S, Rev. 0	Electric Fire Pump Cleaning and Inspection
52GM-MEL-022-0S	Motor Shaft Pinion Key Replacement
51GM-MME-0020 51-GM-MNT-0020	Rebuild of Waste Collector Pump
51GM-MNT-002-0S	Maintenance Housekeeping and Tool Control
52PM-R22-01-0S, Rev. 3	4160 Volt AC Switchgear and Associated Electrical Components Preventive Maintenance
52PM-X43-006-1S	Electric Fire Pump Cleaning Inspection
34SV-E11-001	RHR Pump Operability
AG-MGR-27-0687N	Root Cause Determination
10AC-MGR-004-0S	Deficiency Control System
40AC-REG-002-0S	Federal and State Requirements
10AC-MGR-012-0S	Plant Event Analysis and Resolution Program
DI-REG-08-1285N	DC, SOR and LER Trending Program
DI-MNT-02-1085N, Rev. 3	Maintenance History and Trending Program
52CM-MME-001-0S, Rev. 2	Repacking Valves and the Adjustment of Valve Packing
52CM-MME-005-0S, Rev. 1	Limitorque Valve Operator Models MB-0 through SMB-4 Mechanical Maintenance
52CM-MME-011-0S, Rev. 2	Gate and Globe Valve Repair
52CM-MME-013-0S, Rev. 0	Purge and Vent Valve T-Ring Replacement
51GM-MNT-002-0S, Rev. 3	Maintenance Housekeeping and Tool Control
42SV-SUV-004-2S, Rev. 1	Safety Relief Valve ISI Test
10AC-MGR-003-0S, Rev. 9	Preparation and Control of Procedures

10AC-MGR-001-0S, Rev. 4	Plant Organization, Staff Responsibilities and Authorities
AG-ENG-03-1185N, Rev. 1	GE Service Information Letters (SILs) and Rapid Information Communication Service Information Letters (RICSILS) Review and Tracking
42EN-ENG-014-0S, Rev. 1	ASME Section XI Repair Replacement Program
50AC-MNT-001-0S, Rev. 8	Maintenance Program
DI-OAP-10-0588N, Rev. 0	Planning and Control Maintenance Work Order Processing
DI-MNT-10-0287N, Rev. 0	Interim Qualification Job Assignment
53PM-MON-001-0S, Rev. 0	Vibration Monitoring of Rotating Machinery
53PM-MON-002-0S, Rev. 0	Lubrication Analysis
50AC-MNT-007-0S, Rev. 1	Preventive Maintenance Program
20AC-ADM-003-0S, Rev. 2	Vendor Manual Control
DI-TRN-29-0286N, Rev. 0	Vendor Provided Training
26MC-MTL-003-0S, Rev. 0	Vendor Manual Review
95IT-OTM-001-0S, Rev. 0	Maintenance Work Order Functional Test Guideline
AG-ENG-01-0786N, Rev. 0	Control for Technical Information Letters (TIL's)
20AC-MTL-001-0S, Rev. 0	Procurement of Materials and Services
GEN-12750, Rev. 6	Qualification and Testing of nondestructive Testing (NDT) Personnel
40AC-QCX-001-0S, Rev. 3	Quality Control Inspection Program
45QC-INS-004-0S, Rev.1	Visual Examination Procedure, Piping and Component
45QC-INS-005-0S, Rev. 1	Visual Examination Procedure for Structural Steel
45QC-INS-006-0S, Rev. 0	Liquid Penetrant Examination Procedure
45QC-INS-008-0S, Rev. 0	Magnetic Particle Inspection
45QC-QCX-002-0S, Rev. 2	Quality Control Inspection Plans

45QC-QCX-009-OS, Rev. 0,	Quality Control Document Review and Hold Point Assignment
45QC-PQL-001-OOS, Rev. 3	Qualification Of Inspection Personnel
A-MB-01, Rev. 1	Weld Inspection of B31.1 Component
QA-05-17, Rev. 4	QA Surveillance
31GO-OPS-006-OS, Rev 1	Limiting Conditions For Operations (LCO)
42EN-ENG-010-OS, Rev. 2	Requisition Review for Quality Requirements
40AC-ENG-011-OS, Rev. 2	Environmental Qualification Program
55MC-PRO-001-OS, Rev. 2	Procurement Document Processing
26MC-MTL-001-OS, Rev. 2	Materials Receiving
45QC-QCX-001-OS, Rev. 2	Materials Receipt Inspection
50AC-MTL-002-OS, Rev. 2	Identification and Control of Material and Equipment
55MC-MTL-003-OS, Rev. 2	Material Identification and Issue Control
50AC-MTL-003-OS, Rev. 2	Warehouse Preservations, Handling, Shipping Storage of Materials Equipment
26MC-MTL-002-OS, Rev. 0	Preservation, Storage and Handling of Material & Equipment
42EN-ENG-009-OS, Rev. 4	Equivalency Determination of Replacement Parts or Materials
51GM-MNT-002-OS, Rev. 3	Maintenance Housekeeping and Tool Control, 11/9/87
34AR-654-051-1, Rev. 0	Annunciator Response Procedure - Control Building Service Air Trouble, 10/01/85
10AC-MGR-003-OS, Rev. 9	Preparation and Control of Procedures, 10/20/88
62RP-RAD-003-OS, Rev. 1	Use and Care of Respirators
60AC-HPX-006-OS, Rev. 3	Respiratory Protection Program
PROCEDURE NUMBER	TITLE
62EV-SAM-005-OS, Rev. 2	Monitoring Program for Detection of Releases Via Unplanned Routes, 10/19/88

DI-RAD-03-1087N, Rev. 1	Survey/Inspection Frequency and Work Schedule, 8/8/88
34AR-700-040-2, Rev. 0	Annunciator Response Procedure, 8/23/85
34AB-OPS-020-2S, Rev. 4	Loss of Instrument and Service Air System, 12/12/88
34AB-OPS-020-1S, Rev. 4	Loss of Instrument and Service Air System, 12/13/88
52PM-P51-001-1S, Rev. 1	Instrument and Service Air Maintenance, 2/1/89

APPENDIX B

List of Work Orders Reviewed

Work Order Number	Description
2-88-4802	Cooling Fan 2A2 Motor Changeout MPL #2W24-C002
2-88-4922	Inspect Brushes on Recirc Pump Motor Generator Sets MPL # 2B31-S001A/B
2-88-1788	Valve Air Leak
2-88-01810	Valve Air Leak
1-88-08388	PM on Electric Fire Pump 1X43-C001
2-89-00536	Repair MSIV
1-88-8411	Replace Battery for Demineralizer Programmable Controller
1-89-00227	Annunciator in Alarm For Safety/Blowdown Valve Leak
1-87-02710	Valve 2B21 - F019 Failed to Close
2-87-02714	Switches not Sensing Vacuum
2-88-01788	Valve Air Leak
2-88-01787	Turbine Building Vent Supply From Low Flow Alarm
2-88-02239	Valve Air Leak
2-87-04312	Water in Switch Internals
1-88-01286	Indicating Switch Failed to Respond
1-88-08388	Preventive Maintenance on Electric Fire Protective Pump
1-89-308	Motor Shaft Pinion Key Replacement
1-89-309	Motor Shaft Pinion Key Replacement
2-89-400	Rebuild of Waste Collector Pump
2-88-1906	Rebuild Condensate Pump
2-88-1907	Rebuild Condensate Pump

Work Order Number	Description
2-88-3177	Rebuild Condensate Pump
2-89-540	Correct Seal Water Leak on Feedwater Pump
1-89-821	Correct Seal Water Leak on Feedwater Pump
2-88-00460	Complete Rework on RCIC steam supply Isolation valve 2E51-F007
2-88-01260	Changed torque switch settings on 2E51-F007
2-88-01325	Changed Stem on Valve 2E51-F007
1-88-07113	Change torque switch settings to repair cracked yoke on HPCI Isolation Valve 1E41-F002
2-88-04575	Repair Coupling on Recirc M-G Set 2B31-S001A
2-88-04345	Repair oil mist eliminator on Recirc M-G Set 2B31-S001A
2-88-02384	Correct gage labeling on lube oil pump: headers on Recirc M-G Set 2B31-S001A
28-88-02226	Correct erratic tachometer on Recirc M-G Set 2B31-S001A
2-88-02156	Repair pump outboard oil seal leak on Recirc M-G Set 2B31-S001A
2-88-02155	Repair oil leaks from fluid drive filters on Recirc M-G Set 2B31-S001A
2-88-02151	Repair check valve bonnet leak on Recir M-G Set 2B31-S001A
2-88-02149	Repair fluid drive oil leak from 2" flange on Recirc M-G Set 2B31-S001A
2-88-02132	Repair oil leaks from bearing plugs and sightglasses on Recirc M-G 2B31-S001A
2-88-02067	Repair Binding scoop tube actuator on Recirc M-G Set 2B31-S001A
2-88-02060	Correct lack of pump speed runback after trip on Recirc M-G Set 2B31-S001A

Work Order Number Description

2-88-02152	Repair bonnet and packing leaks on valves F154A and F157A on Recirc M-G Set 2B31-S001A
2-88-04845	Repair lack of scoop tube positioner reset on Recirc M-G set 2B31-S001B
2-88-03468	Repair field breaker on Recirc M-G Set 2B31-S001B
2-88-02688	Repair tachometer on Recirc M-G Set 2B31-S001B
2-88-02384	Repair lube oil suction header gages on Recirc M-G Set 2B31-S001B
2-88-02159	Repair fluid drive flange leak downstream of valve F106B on Recirc M-G Set 2B31-S001B
2-88-02157	Correct fluid drive sightglass leaks on Recirc M-G Set 2B31-S001B
2-88-02154	Repair pump outboard oil seal leak on Recir M-G Set 2B31-S001B
2-88-01342	Repair fan in M-G Set room of Recirc M-G Set 2B31-S001B
2-88-02069	*Correct high DP on CRD Drive water filter 2C11-D003B
2-88-01694	*Correct high DP on CRD Drive water filter 2C11-D003B
2-88-01606	*Correct high DP on CRD Drive water filter 2C11-D003B
2-88-01592	*Correct high DP on CRD Drive water filter 2C11-D003B
2-88-01439	*Correct high DP on CRD Drive water filter 2C11-D003B
2-88-01162	*Correct high DP on CRD Drive water filter 2C11-D003B
2-88-00522	*Correct high DP on CRD Drive water filter 2C11-D003B

*Note: These were clearly identified as repetitive failures and were due to initial poor water quality during start-up from refueling outage.

1-88-07475	Repair bent coupling guard on HPCI pump 1E41-C001
1-88-07248	Repair governor valve control circuitry for HPCI pump 1E41-C001
1-88-05104	HPCI pump 1E41-C001 tripped on turbine exhaust pressure - Repair as necessary

Work Order Number Description

Work Order Number	Description
1-88-02513	Repair leak in seal water line on suction side of HPCI pump 1E41-C001
1-88-01733	Repair gear box oil leak on HPCI pump 1E41-C001
1-88-01237	Replace missing alignment bolt on gearbox for HPCI pump 1E41-C001
2-88-00460	Repair seat leakage on RCIC steam isolation valve 2E51-F007
2-88-00775	Reset Limitorque motor operator using MAC tester on RCIC steam isolation valve 2E51-F007
2-88-00760	Resplice cable for RCIC steam isolation valve 2E51-F007 at Penetration 2T52-X105C
2-88-01260	Increase torque switch setting for RCIC steam isolation valve 2E51-F007
2-88-01277	Rotate Limitorque operator on RCIC steam isolation valve 2E51-F007
2-88-01325	Troubleshoot and repair RCIC steam isolation valve 2E51-F007
2-88-02575	Repair packing leak on RCIC steam isolation valve 2E51-F007
2-88-02612	Replaced damanged motor on RCIC steam isolation valve 2E51-F008 (Note: motor meggered ok - root cause of failure not completed)
2-88-01262	Repair damaged motor lead on RCIC steam isolation valve 2E51-F008
2-88-01240	Repair packing leak on RCIC steam isolation valve 2E51-F008
2-88-01213	Increase torque switch setting and re MAC test RCIC steam isolation valve 2E51-F008
2-88-00625	Repair broken flex cable EEA90738 on RCIC steam isolation valve 2E51-F008
2-88-00605	Replace brittle control leads on RCIC steam isolation valve 2E51-F008

2-88-02695	Repair faulty limit switch on RCIC steam to turbine valve 2E51-F045
2-38-02581	Repair mid-position stop on closing for RCIC steam to turbine valve 2E51-F045
2-88-01953	Repair leak-by on RCIC steam to turbine valve 2E51-F045
2-88-01025	Adjust limit switch per MAC test on RCIC steam to turbine valve 2E51-F045
2-88-00231	Repair/replace Bellville washer pack on RCIC steam to turbine valve 2E51-F045
1-88-08045	Correct Faulty trip on RCIC steam to turbine valve 1E51-F045
1-88-04251	Adjust declutch lever and fingers on RCIC steam to turbine valve 1E51-F045
1-88-04248	Adjust operator to prevent coasting into backseat on RCIC steam to turbine valve 1E51-F045
1-88-01311	Perform MAC test at system flow on RCIC steam to turbine valve 1E51-F045
1-88-01310	Perform static MAC test on RCIC steam to turbine valve 1E51-F045
1-88-00589	Correct seat leakage on RCIC steam to turbine valve 1E51-F045
2-86-3811	Verify torque of bottom bolts to 45-50 foot pounds for Unit 2 HCUs
1-86-7330	Install missing flat washers and verify torque to 45-50 foot pounds for Unit 1 HCUs
1-88-5022	Modify reactor building RHR supports E11-RHR-H33, 34, 35, 293 and 274
2-85-1424	Weld patch on Rx building roof drain 2T55-RSD-5
2-89-00724	Torque back-to-back top plate cap screws to 15-25 foot pounds and confirm full thread engagement for all Unit 2 HCUs
1-89-01077	Torque back-to-back top plate cap screws to 15-20 foot pounds and confirm full thread engagement for all Unit 1 HCUs

1-88-07300	Weld patch to repair valve 1N71-F200 (FW001)
2-89-0619	Fabricate and install motor base for surge tank pump 2G11-C015 (FW Nos. 1-8)

APPENDIX C

List of Components/Systems/Areas
Inspected During Walkdown Inspections

Unit 1 Main Generator

4160V Station Service Switchgear
- 1G 1R24-S045
- 1B 1R22-S002
- 1C 1R22-S003
- 1D 1R22-S004
- 2A 2R22-S001
- 2B 2R22-S002
- 2C 2R22-S003
- 2D 2R22-S004
- 1E 1R22-S005
- 1F 1R22-S006
- 1G 1R22-S007
- 2E 2R22-S005
- 2F 2R22-S006
- 2G 2R22-S007

600V Station Service Switchgear
- 1B 1R23-S002
- 1R23-S001
- 2A 2R23-S001
- 2B 2R23-S002

Motor Control Center (MCC)
- 2D 2R24-S035
- 208V 1G 1R24-S045
- 250 VDC 2A 2R24-S021
- 600/208V 2A 2R24-S013
- 600/208V 2C 2R24-S011
- 600V 2E 2R24-S018B
- 600V 2E 2R24-S018A
- 250VDC 2B 2R24-S022

Five (5) diesel generators and associated batery rooms and electrical equipment rooms

Cooling tower electrical room

Cooling tower fan motor 2W24-C002 at tower 4

Inverters 1R44-S002 and S003

Inverters 2R44-S002 and S003

Units 1 and 2 control room and back panel areas

Unit 2 Recirc pump motor generator sets 2B31-S001A and B

Backwash Pump 2N21-C008

Condensate Pump 2N21-C001A

Condensate Booster Pump 2N21-C002A

Recirc MG Set 2B31-S001B

Valve 2P42-F3006B

Lube Oil Circ Pump 2B31-S001B3

EHC Oil Rooms (Unit 1) including EHC Pumps IN32-C001A and 1N32-C001B and EHC Coolers

Reactor Building Closed Cooling Water Heat Exchangers 2P42-B001A and 2P42-B001B and Pumps 2P42-C001A and 2P42-C001B

Backwash Pump 1N21-C008
Unit 1 demineralizer Valve Nest
Condensate Pumps 1N21-C001A, 1N21-C001B, and 1N21-C001C

Unit 1 NE diag. and HPCI Room including Main Pump 1E41-C001 and
Booster Pump 1E41-C001

Unit 1 SE diag. including Pump Motors 1E11-C002A, 1E11-C002C, and 1E11-C001A

Unit 2 SE diag. HPCI Room including Main Pump 2E41-C001 and Booster Pump
2E41-C001

FW Pump N21-C003A and general area

Electric Fire Protection Pump 1X43-C001 and general area

Fire Protection Jockey Pump 1X43-C003 and general area

Unit 2 Loop A RHR Pump 2E11-C002A;
discharge pressure gage 2E11-R003A;
suction pressure cage 2E11-R002A;
and nearby area

Unit 2 Core Spray Pump 2E21-C003A and Valve 2E21-F126A

Control Room and annunciator system for main steam

Unit 1 Turbine Building

Unit 1 and Unit 2 HCUs

Unit 1 and Unit 2 Reactor Buildings at 130 foot elevation

Unit 1 and Unit 2 Turbine Building east cableways

Unit 1 and Unit 2 Service Air System P51

Clean and Hot machine shops

Valves as listed below:

1Z43-F45-1AB	2P51-F087
1Z43-F45-2AD	2U43-F309C
1P42-F057	2P51-F098
1P41-F368B	2U43-F091
2U45-F092	2P41-F052B
2T48-F121	2P41-F070B
2T48-F120	2P41-F059
2T48-F014	2P41-F070A
2T48-F111	2P41-F050A
2C11-F002A	
2C11-F047A	
2C11-F046B	
2C11-F005	