Recommendation:

At BFN, persue CM actions resulting from ISIs in a more timely manner. Ensure all CM MRs resulting from ISI activities are promptly placed on the tracking system so that they are processed to completion.

Finding G-4

At all three sites, the scheduling of different types of maintenance (PM, CM, predictive maintenance, SIs, MIs, IMIs, etc.) is not coordinated to minimize equipment downtime, eliminate excessive PMT, minimize radiation exposures, and improve productivity. No effective mechanisms or programs are currently in place to identify maintenance activities that should be performed at the same time. Currently, the proficiency of individuals within the planning organization is the principle mechanism or the only mechanism for identifying related work on given equipment or in the same area.

WBN and SQN have recognized these scheduling shortcomings and are presently considering improvements. WBN plans to address this in a new maintenance program on the PRIME computer. However, no implementation schedule was available for this new program.

BFN also has recognized these scheduling shortcomings and has a computer-assisted program in place to assist in common work scheduling for any specified piece of equipment. Planning activities were observed that demonstrated this capability. However, this program does not include a method of grouping by work type, equipment type, or location.

Recommendation:

Implement an improved planning and scheduling system that includes the capability to identify all anticipated work by the applicable system, location, type of work, and other attributes that may aid in scheduling common work together. Utilize this system to schedule like maintenance activities together to eliminate unnecessary testing, radiation exposure, equipment down time, and wasted effort for maintenance crews.

Finding G-5

Determination of the appropriate quality classifications for MRs requires excessive effort and time, and is prone to errors. At WBN, an average of 20 minutes for each MR was expended by planners to determine quality classifications. The classifications include, for example, CSSC applicability, Code of Federal Regulations 10 CFR 50.49 (Environmental Qualification (EQ)) applicability, class 1E designation, and "limited quality assurance (QA)" applicability. There are a number of lists that

must be consulted by the planners to determine quality classifications. These include: CSSC list, Q list, cable and conduit schedule, 50.49 lists, and drawings.

At SQN a difference between a 10 CFR 50.49 index and information in the equipment folder (individual binder) was found after MR work was initiated. Though 10 CFR 50.49 requirements were applicable, an error in the index and the 50.49 list caused the work to be improperly classified as 50.49 requirements not applicable.

At WBN, planners use an uncontrolled copy of a conduit list obtained from DNE in Knoxville, and 50.49 lists used were not controlled. There are a number of inconsistencies between the lists, some of which have been documented by Corrective Action Reports (CARs). It appears that EQIS, if fully developed and controlled, could aid significantly in improving this process.

Recommendation:

Consolidate the variety of existing equipment classification lists into a consolidated equipment listing for each site showing all the applicable quality, regulatory, or other classification needed to ensure that work is planned and executed to the appropriate standards. Include the lists mentioned in the finding. Establish controls over the content of the listing so that it can be used reliably as an authoritative source. Assign a responsible corporate manager responsibility for the effort and assign qualified support from DNE, Division of Nuclear Quality Assurance (DNQA), and the sites to help ensure the end product is accurate and readily usable for all potential users. Consider establishing this list on the EQIS computer program.

H. CONTROL OF MAINTENANCE ACTIVITIES

Finding H-1

Minor design changes needed to support plant maintenance and operation are not being accomplished in a timely manner. As a result, temporary alterations have been used to make permanent modifications. Maintenance managers and supervisors interviewed at all sites stated that the minor modification process is not effective in meeting maintenance needs.

The plant staffs do not engineer any changes affecting design-controlled drawings. Minor changes currently must go through the normal process for requesting (Design Change Request (DCR), Field Change Request (FCR), authorizing (ECN), and implementing changes (via workplans). In this process, minor changes compete in priority with the total modification backlog. The process in place for making minor modifications does not provide the expedient handling needed. An expedient process is possible without adversely impacting the necessary change controls.

DNE has recently located large project engineering staffs on the sites to expedite design changes. The effort has not been fully effective because these staffs are reportedly not permitted to authorize changes without approval of engineers in the Knoxville office. Examples of minor modifications processed through the full design change process, where that may not be necessary, include revision of a drawing dimension to permit metallurgical sampling of an installed bolt; revision of drawings to correct discrepancies; installation of a deck plate for personnel safety over a maintenance rail installed in the floor; and change of recorder pens from capillary type to felt type. Some DCRs involving substitution of parts have taken several years to process.

More than half of the temporary alterations presently in place are pending action to be made permanent; 121 of 151 at SQN, 218 of 358 at BFN, and 71 (and possibly more) of 240 at WBN. These kinds of temporary alterations place additional and redundant demands on plant and DNE resources and complicate configuration management. Temporary alterations pending action to be made permanent include three for meeting Technical Specification requirements, several industrial safety items, and one with a related DCR 9-1/2 years old.

Recommendation:

Establish an expeditious process within DNE for approving and implementing minor design changes needed to support plant operations and maintenance. Include provisions for simplifying selected portions of the design change process when appropriate. Ensure that the expeditious process continues to give adequate attention to required safety reviews. Provide for processing and approval of minor design changes on site. Consider establishing a grading system for modifications based upon safety significance and complexity and assigning approval authority to DNE Knoxville, DNE site, or maintenance engineering as appropriate, with emphasis on handling modifications at the lowest qualified level. Continue current efforts to reduce the number of outstanding temporary alterations. Monitor results of improvement efforts to determine if minor design changes are being processed in a timely manner and whether or not temporary alterations continue to be used for permanent changes.

Finding H-2

No uniform and effective priority system exists for managing MR work classified as routine at BFN.

The routine priority is used for a large majority of the maintenance work performed. Within that priority, no uniform, approved method identifies the most important or urgent work. One of three P&C scheduling units uses numerical codes in the MR

tracking system to relate maintenance activities to plant schedule milestones. Though this effort helps prioritize and schedule work, it is done only on a limited basis.

Recommendation:

Establish a uniform priority system for maintenance work at all the sites. Provide enough different priorities that planners and schedulers can effectively coordinate their efforts with minimum involvement by line managers and supervisors after prioritization. Provide for considering plant schedules when assigning priorities.

Finding H-3

At BFN and WBN, some MRs are signed off as complete without actually completing the work needed, and without initiating separate identifiable action to ensure that the stated deficiencies are corrected. Examples include the following:

Browns Ferry

- Two MRs were closed out even though the specified PMT was not performed. The required PMT steps in the procedures could not be performed and this fact was appropriately documented by the craft on the MRs. The MRs were subsequently signed off as complete, and no actions were taken to ensure that the PMTs would be performed at a later date.

- Work performed under one MR to correct reported valve leakage was not successful. The description of work performed stated the valve continued to leak and needed to be replaced. The MR was signed off as complete, and no other MR could be found that would replace the valve or correct the leakage.

- An MR for a pressure gauge indicated that an accurate pressure measurement could not be obtained. The PMT specified was to verify proper operation. The description of the work performed on the MR stated that snubbers were needed on the gauges. There was no indication available that snubbers had been requested or that the initial problem was corrected.

Watts Bar

- A PM was being performed on a safety-related pump motor. The PM work instruction specified PMT to verify proper operation by ensuring that no leaks occurred and the oil level was maintained with the motor running. The PMT was not performed, and the PMT portion of the MR

was N/A'd. The hold order associated with the PM was released; the craft signed off the maintenance work as complete; and operations signed off all work/testing as complete.

Recommendation:

Strengthen adherence to the requirements stated on MRs and re-emphasize to supervisors the need to follow up on deviations or problems noted by the work crews. Strengthen the MR closeout process to ensure that appropriate follow-up action is, in fact, taken. Consider using the P&S staff or system engineers to review completed MRs and initiate follow-up to ensure satisfactory correction of the reported problems.

Finding H-4

At BFN and WBN, available manpower is sometimes not effectively utilized. Unnecessary personnel are often assigned to simple tasks, and subjourneymen are seldom permitted to perform work other than as a helper or laborer.

Browns Ferry

On some occasions, planned contingency work was not available for crews that were unable to proceed with their normally planned work. Significant idle time resulted.

For some of the activities observed, 25 to 50 percent of the manpower assigned was not needed or utilized to perform the work. Interviews revealed it was general practice to use no less than two persons on any job, even for jobs that could clearly be done easily and safely by a single person.

Watts Bar

Two journeymen and one subjourneyman were assigned to disassemble a small valve. The two journeymen alternately worked on the valve while the subjourneyman only observed.

Two journeymen and one subjourneyman were assigned to replace three quarts of oil in a pump motor. Only one person at a time worked on the motor while the others handed tools, rags, or oil as needed.

Recommendation:

Maintain a backlog of planned jobs ready to work on short notice, and assign these to crews that complete work ahead of schedule or that are unable to proceed on scheduled tasks. Implement work assignment guidelines that will ensure adequate numbers of workers are assigned, considering the nature of the work and worker safety, but preclude assignment of excessive or unnecessary manpower.

Establish definitive guidance for assignment of work to subjourneyman so that these workers are permitted to perform portions of journeyman work for which they are qualified.

Finding H-5

At all sites significant work delays occur, and resources are used inefficiently when minor changes to MR work instructions become necessary.

MR work instructions prepared for CSSC activities become inflexible requirements after review and approval by PQA. The NQAM requires this level of control and does not allow authorization of needed changes in work instructions as work progresses without going through the entire MR approval process.

There are no guidelines that describe the kinds of work that can be performed outside the initial scope of a work instruction without a formal change to the work instruction.

Examples of cases where added work seemed appropriate without a formal MR revision are as follows:

- During repair of a moisture separator leak, workers noted the connected piping needed some cleaning. A delay resulted while new MR instructions were initiated and approved.

- During troubleshooting of an electrical breaker for a ventilation blower, a new troubleshooting MR was needed when the fault was determined to be downstream of, not in, the breaker in question. Again, a substantial delay resulted while a new MR was prepared.

Recommendation:

Establish a more flexible change process for MR work instructions to minimize work delays and improve utilization of resources. Assign line managers and supervisors more authority to approve, in the field, changes in the scope of work and work methods that can be safely performed by the work crews and do not substantially change the intent of the MR. Require all such changes to be documented on the MR and, as appropriate, review completed MRs for acceptability of the changes. Ensure that line supervisors understand their responsibility for knowing and meeting applicable quality requirements.

Finding H-6

At WBN, some complicated or multi-disciplined CSSC MRs are not receiving the Plant Operating Review Committee (PORC) review required by the NQAM. Some MRs include detailed step-by-step instructions several pages long that have not been PORC-reviewed. Examples are as follows:

- A troubleshooting MR for the diesel generator used an attachment pieced together from existing procedures for electrical testing on 6900v motors. There is presently no general or generator specific procedure for electrical testing.

- A mechanical MR to add RTV insulation to a sleeve penetration had 8 pages of handwritten instructions. A PORC-reviewed modifications and additions instruction (M&AI) containing instructions for this same activity exists for electrical penetrations.

- An MR to level a high pressure fire pump had 14 pages of instructions consisting of a marked-up copy of an MI.

Recommendation:

Establish structured training for maintenance personnel at WBN on NQAM requirements associated with maintenance activities, the proper methods for implementing those requirements, and line responsibility for meeting NQAM requirments. Update maintenance employees in a timely manner whenever revisions are made to the NQAM. Conduct periodic refresher training. Strengthen supervisory monitoring and review of maintenance to assess adherence to applicable quality requirements. As an alternative, consider implementing the methods used by other utilities to eliminate the need for PORC review of MR work instructions.

Finding H-7

At SQN and [illegible] some MR work instructions did not contain sufficient guidance and instructions to ensure the work was adequately performed.

Sequoyah

During repacking of ERCW and Raw Cooling Water (RCW) pumps some errors were made, in part because the work instructions did not contain guidance needed by the craft workers. In one case, the work instructions said simply "repack." In the other case, though some step-by-step instructions were given, important information such as the number of packing rings to use, packing gland tightness, and gland inspection instructions, were omitted.

Watts Bar

Several MR work instructions to troubleshoot and repair referenced MIs that contained no additional guidance, but simply stated "troubleshoot and repair." In some of these cases, a more detailed troubleshooting plan would be appropriate.

MR work instructions for torquing pump column flanges specified a final torque value, but did not specify interim torque passes or the desired condition of the bolts prior to torquing (clean dry or lubricated).

Recommendation:

At SQN and WBN establish guidance for the level of detail and nature of information to be included in work instructions. Include guidance on tasks that can normally be considered within the skill of the craft and what types of special information should normally be included in work instructions. Examples of such special information include torque values, clearances, alignment specifications, special step sequencing, special inspection requirements, and parts and lubricant specifications. Where possible, use work instructions that have been successfully used on previous maintenance activities.

I. POSTMAINTENANCE TESTING

Finding I-1

At all sites, appropriate PMT is sometimes not clearly defined on MRs and is sometimes not performed. Personnel responsible for specifying and approving PMT have not been adequately trained or provided sufficient written guidance for determining appropriate PMT. Section supervisors stated that they rely on the responsible individual's experience to specify PMT correctly, but several individuals stated that they had no experience in designating PMT.

A review of MRs indicated that sometimes the identified PMT requirements were "verify proper operation." Though this is the objective of such testing, more specific guidance is normally appropriate.

Browns Ferry

A review of approximately 100 MRs selected at random indicated that "verify proper operation" was frequently the specified PMT. Five of those inappropriately used "verify proper operation" as the PMT. More specific guidance was appropriate, such as "perform a leak check", "measure the response time for valve closure" or perform a calibration.

A review of another group of approximately 200 MRs on CSSC equipment indicated that four MRs had the PMT requirements block marked "N/A" even though the maintenance performed could affect proper operation of the component.

Sequoyah

One work request, involving removal of a CSSC valve bonnet, did not require seat leakage and bonnet leakage tests, as would be appropriate. The only PMT specified was to check for free valve operation.

Inadequate PMT on an ERCW motor-operated valve resulted in damage to the valve operator when an attempt was made to return it to service.

An MI did not specify a rotation check after reconnecting the electrical leads to a motor.

Watts Bar

Thirty-two of sixty-eight MRs randomly selected for review stated variations of "craft to verify proper operation" and "craft to verify operation acceptable" without listing a reference document or criteria that could be used to judge acceptability.

Recommendation:

Establish uniform PMT guidelines to ensure by testing, where possible, that maintenance adequately corrected the original problem, did not create a new problem, and that the affected system or components are ready to be returned to service. Train personnel who prepare working instructions and specify PMT requirements on the content of the guidelines.

J. MATERIALS SUITABILITY

Finding J-1

The stores inventory as shown on the MAMS computer does not reflect the current status of available materials within Power Stores.

Planners cannot utilize MAMS information effectively for planning MRs due to the unreliability of the MAMS data base inventories. Items withdrawn from Power Stores on a material requisition form are not promptly subtracted from the MAMS data base inventory. Time needed to assign account numbers to requisitions results in delays of two to five days in updating the MAMS inventory. In addition, items received by Power Stores that have not previously been assigned TVA Item Identification Code (TIIC) numbers cannot be placed in the MAMS data base until the Power Stores Branch Item Identification Section (located in Chattanooga) assigns a TIIC number. The required time for this process was stated in interviews to be 3 weeks minimum. Material can be used before TIIC numbers are assigned, but during that time, there is no reliable way for the requestor (user) to know it is available.

In addition, at BFN and SQN, known errors in MAMS inventory levels exist for extended periods, and there does not appear to be an effective method for correcting these errors. In at least one case, a "dummy" material requisition was requested by and given to power stores so that a MAMS inventory error could be eliminated. Though the requisition showed that material was issued, there was, in fact, none in stock and none issued.

Recommendation:

Establish a mechanism to update the MAMS data base promptly when material is withdrawn from Power Stores. Establish a reliable mechanism to inform requestors of the availability of parts during the delay period while awaiting TIIC number assignment. Improve inventory and accounting methods to provide for prompt correction of inventory discrepancies in the MAMS data base and prompt reordering of replacement materials when needed. Stop the practice of using false issue documents, indicating an issue has actually been made, to correct inventory discrepancies. Consider formation of a task force or taking other special measures to identify and develop corrective measures for problem areas where the MAMS system and inventory practices are not responsive to user needs.

Finding J-2

Reordering of stock materials when established reorder points are reached is being unnecessarily delayed. A system is now in place which allows automatic reordering of selected stock materials once the item description (details and characteristics necessary for procurement) is approved and coded into the MAMS data base. Updating and approval of item descriptions is being performed by the sites. So far, only a small percentage of stock items has been approved for automatic reorder, and the approval process is causing considerable reordering delays.

Browns Ferry

Currently, there are approximately 1,300 items below the reorder point which have not been reordered. In February there were 1,500 in this category. Some of the items currently not reordered have been below the reorder point since February 1986. There are two contributors to this backlog; approximately 800 requiring item description approvals and approximately 500 requiring initiation of purchase requisitions by Power Stores. A portion of the backlog reportably resulted from a recent inventory.

Sequoyah

This problem was not evaluated at SQN.

Watts Bar

Approximately 150 purchase requisitions, some containing multiple items, are waiting for PQA approval. An additional 86 (approximate) material requisitions are being held up for a Materials Unit review to identify attachments to be added to the requisitions. No item descriptions to allow automatic reorder are being processed at this time because of the immediate need for procurement of other items. The current review process results in requisition backlogs, redundant reviews, and unnecessary delays in implementation of the automatic reorder mechanism.

Recommendation:

Expedite actions to develop stock item descriptions and activate automatic reordering of stock material. Consider establishing a working group consisting of DNQA and corporate Division of Purchasing personnel to develop and code item descriptions (details and characteristics necessary for procurement) and approve input into the automatic reordering system in Power Stores.

Finding J-3

At BFN, some warehoused material and equipment is stored in a manner that unnecessarily delays issue to requisitioners.

Warehouse space located about one mile outside of the plant security area is being used for storage of some maintenance material with relatively frequent demands for issue. It reportedly takes up to three hours to deliver material from this location, primarily because of security inspections. Though considerable warehouse space is available within the plant, some is used for equipment and parts with very low demand rates. Warehouse personnel stated that the selection of materials to be warehoused in the plant has not been modified since initial stocking of the warehouse during plant startup.

Some designated storage locations in the Service Building storeroom were not large enough, and overflow material was stored in additional locations. Only the primary location is indicated in MAMS, and overflow areas for the material requested must be checked, resulting in decreased efficiency.

Recommendation:

At BFN Power Stores, relocate infrequently issued items to the warehouses outside the security area and move frequently requested items to the inside warehouse, as possible. Consider providing reduced quantities for ready service issue in the

Recommendation:

Strengthen corrective measures to improve the timeliness of material procurement. Consider timely implementation of Nuclear Power Procurement Problems Task Force recommendations and the NSRS report R-84-17-NPS recommendations.

K. CONTROL AND CALIBRATION OF MEASURING AND TEST EQUIPMENT

No findings were noted in this area at any of the sites.

L. MAINTENANCE TOOLS AND EQUIPMENT CONTROLS

Finding L-1

Good Practice: At WBN, a computerized real-time inventory control system has been implemented as an interim correction for identified deficiencies in tracking main tool room inventories. This system has elements which identify the current inventory, the number of tools permanently issued, the number of tools temporarily issued, and reorder points. No problems with availability of tools and equipment from the main tool room were noted during observations.

Finding L-2

At BFN and SQN, the inventory and accountability mechanisms for maintenance tools and equipment do not provide adequate control. As a result, tools and equipment are sometimes unavailable to the craft performing work, and replacement costs are high. At BFN, no inventories are maintained of tools awaiting decontamination or in hot tool storage. At BFN and SQN, some tools confiscated for decontamination are not properly recorded in the tool accountability system. Tools returned by persons other than those who checked them out are also not properly recorded. Current inventories are not maintained in any of the tool rooms. This finding does not apply to tagged tools such as serialized measuring and test equipment. All plants reported that they have initiated plans to install computerized bar code inventory and accountability systems; however, these systems have not been approved.

Recommendation:

Establish and implement uniform methods for inventory and accountability of small tools and equipment at each of the sites to correct the problems noted. Consider implementation of the computerized bar code system. Include in the system real time inventory and accountability for persons and places such as the hot tool room and the decontamination facility.

Finding L-3

At BFN, defective rigging and electric hand tools are not repaired and returned to service in a timely manner. Several barrels of defective rigging and electric hand tools were observed in the outage tool room and hot tool storage areas. Some of the tags on this equipment indicated the defects had existed for nine months.

Recommendation:

Repair defective rigging equipment and electric hand tools promptly to reduce the need for large inventories. Consider assigning responsibility for inspection, repair, replacement, and disposal of rigging equipment and electric hand tools to a dedicated group of workers.

Finding L-4

At BFN, rigging tagged as defective was not segregated from acceptable rigging. This practice could lead to the use of defective rigging if the tag was separated from the item.

Recommendation:

Segregate defective rigging from serviceable rigging and clearly label each storage location.

M. MANAGEMENT INVOLVEMENT

Finding M-1

The involvement of maintenance management and supervision in ongoing maintenance activities needs to be strengthened. Most managers and supervisors recognized the value of increased field involvement with maintenance activities, but meetings, administrative duties, and emergent problems were often permitted to interfere. Efforts toward improvement were noted at all three sites.

Browns Ferry

Foremen were at the worksite for some time during most of the activities observed. Higher level supervisory presence was minimal, but appeared to increase during the review period. One of the goals of shifting to the unit organization was to increase supervisory involvement in maintenance activities. Since unitization had begun only two months earlier it was too early to judge its effectiveness.

Although supervision was observed at the work sites, their attention appeared to be focused on the task at hand and housekeeping, safety, or equipment problems in adjacent

areas went uncorrected. Upper management stated additional effort had begun to correct that problem and improve housekeeping standards.

Sequoyah

Foremen were at the worksite for some activities, but there was little presence of higher level supervision. Particular interferences cited by managers were emergent problems, administrative duties, and the number/duration of meetings. Some reported management actions to help free line management include limiting meeting attendees to minimize impact on line supervisors, establishing additional positions to perform administrative functions in the craft sections, and establishing positions on the maintenance superintendent's staff to help deal with multi-disciplined and generic site needs such as maintenance program improvements.

Watts Bar

Foremen were at the worksites at some point during most of the activities observed and higher level supervision was present during some of those.

From observations and follow-up interviews with supervisors, there appeared to be a positive attitude toward increased involvement by supervisors in daily activities. Management coaching, establishment of the planning positions, and the personal initiative of foremen have contributed to the present high level of foremen involvement in the field. However, the number and duration of meetings, administrative duties and emergent problems have adversely impacted group and engineering section supervisors' involvement, particularly in electrical maintenance. Reported management actions to help free line management include the issuance of a letter by the plant manager setting aside time blocks which are unavailable for regularly scheduled meetings and establishment of the planning group. Additionally, the maintenance superintendent had the flexibility to establish additional craft supervisory positions as warranted and staff positions to help deal with multi-disciplined or generic maintenance issues.

Recommendation:

Develop and implement stronger actions to increase management and supervisory monitoring of field maintenance activities. Raise the priority of this effort for managers and supervisors and relieve them, where possible, of tasks that interfere with involvement in and monitoring of day-to-day activities.

Consider the following measures:

1. Assign corporate personnel prime responsibility for developing maintenance program improvements needed at the sites. This effort currently requires substantial efforts and is performed nearly exclusively by the sites. Ensure, however, continuing site involvement in these efforts.

2. Provide technical and administrative assistants to key maintenance managers such as discipline group supervisors (e.g., electrical, mechanical, and instrumentation and control). Use these assistants to relieve the line managers from unnecessary administrative and program development duties.

3. Review the demands placed on supervisor's and manager's time in more detail and eliminate unproductive or unnecessary diversions from line responsibilities. Reduce the number and duration of meetings, especially those with large attendance that do not use attendees' time productively.

4. Adjust clerical staffing as necessary to free technical managers and supervisors from clerical tasks.

5. Substantially strengthen senior management attention to training and coaching in supervisory involvement, and personal involvement in those efforts in the plant.

6. Make supervisory involvement in and monitoring of day-to-day activities a key factor in periodic management performance appraisals.

N. MAINTENANCE HISTORY

Finding N-1

At all three sites, the maintenance history programs often do not provide meaningful, complete, and useful information. Personnel performing maintenance work often do not completely and accurately describe the activities on the MR forms. Furthermore, At BFN and WBN there is no criteria for determining the types of maintenance and equipment for which documentation and retention of historical data is required, other than CSSC, limited QA, Class 1E, and non-CSSC related to Technical Specification compliance.

History information entered into the maintenance history computer programs is normally derived from completed MR forms. The entries on MRs often lack information needed to make future reference most useful. Personnel often do not completely and accurately describe the equipment on which work was performed, the actual work accomplished, the failure(s) that occurred, causes of the problems, and, for SQN and WBN, the manhours expended.

At BFN and WBN, no person or section has been designated as responsible or held accountable for ensuring that information entered into the maintenance history data base is accurate. At SQN, individuals have been assigned to screen MR information for adequacy before entry into the maintenance history data base. Though this has been helpful, additional attention is warranted to further improve the quality of the information entered.

Recommendation:

Establish uniform guidelines for retention of maintenance information on equipment that is important for safe and reliable operation. Include information on such items as man-hours expended, special tools used, causes of failures, and repair techniques or procedures used. Develop methods to improve the usefulness of information entered in maintenance history for future reference. Consider having system engineers prepare history entries from completed MRs and other sources for input into equipment history files by data entry operators. Provide training for maintenance personnel, as appropriate, to improve the quality of information noted on the MR forms during and after maintenance.

Finding N-2

At all three sites, there has been very little use of maintenance history for planning CM and PM activities and for identifying the need for modifications.

Very few of the computer terminals at SQN and WBN have printers convenient to the individuals who need hard copy information; it must be picked up at a remote location. Because of this inconvenience, information needed from historical data bases is normally hand copied from the screen. Handcopying ties up the equipment, is time consuming and is inefficient.

When the need for corrective maintenance is identified, new MR work packages are often generated manually without the benefit of the information contained in past MR work packages. This practice can create errors and inconsistent methods for performing repeated maintenance. It does not foster the use of lessons learned during work and applying these lessons to future activities.

Recommendation:

Provide printers and a copy of microfilmed MRs in each planning section to allow convenient retrieval of previous maintenance request information. Establish a library of selected work instructions used previously so that lessons learned can be carried on reliably. Instruct P&S personnel to use historical information, when possible, to plan and schedule maintenance.

O. QUALITY ASSURANCE

Finding O-1

At all three sites, PQA review of MRs prior to work is not identifying significant weaknesses.

The NQAM requires review of CSSC MRs by PQA prior to starting work to ensure certain elements are adequately addressed. Examples of these elements are skills of the craft, QC hold points, PMTs, clearances and permits, special processes, fire protection, American Society of Mechanical Engineers (ASME) Section XI, common mode failure, class 1E, and plant Technical Specifications. Single PQA reviewers are normally assigned to review MRs for all disciplines (mechanical, electrical, and instrumentation). The technical background of any assigned reviewer is normally in a single discipline. Because of the technical complexities involved with the disciplines and the elements described in the NQAM, an adequate review is often beyond the technical expertise of the designated PQA reviewer. Based upon interviews with PQA personnel, adequate training in MR-related subjects such as PMT (other than ASME Section XI) has not been provided. Sometimes the time restraints and locations for MR review adversely impact the adequacy and thoroughness of the PQA review.

At all three sites, PQA review did not reliably cause correction of problems such as lack of appropriate PMT and lack of technical information needed by craft workers. In some cases, QC inspectors found the need to stop work in progress because work instructions were inadequate, even after PQA approval.

Recommendation:

Evaluate the need for the broad scope of PQA MR reviews currently required by the NQAM before maintenance is begun. Consider, during this review, methods and potential benefits of strengthening line capability and accountability for MR adequacy, including relevant quality program requirements. Revise the NQAM as appropriate, and ensure that persons assigned MR preparation and approval responsibilities are adequately trained to address equipment and quality program needs.

Finding O-2

At BFN and SQN, corrective actions for some problems identified by PQA have not been effective.

CARs and Discrepancy Reports (DRs) written by PQA identify maintenance problem areas. Though dispositions of several reports indicated that corrective actions would be effective, repeated problems showed they were not.

Browns Ferry

Five DRs were written over a period of time for work being performed on a CSSC system without PQA review. The stated corrective action for each DR did not correct the problem as expected, and a CAR was written to document the lack of corrective action. After this CAR was issued there were two additional DRs written for the same condition.

Sequoyah

Twenty-four DRs were written for a variety of discrepancies; e.g., QC holdpoints, non-QA review of MRs, and use of non-CSSC material on CSSC equipment. After corrective action on those DRs was specified, an additional 41 MRs were found with the same problems. As a result, a CAR was issued in April of 1986 to document the ineffectiveness of the corrective action.

Recommendation:

At BFN and SQN increase management attention in the corrective action process to ensure actions taken to correct identified problems are centered on root causes, not symptoms, and have long-term solution potential. Strengthen line management appreciation for, and attention to, quality program requirements. Establish improved mechanisms to evaluate the effectiveness of corrective actions in preventing recurrence. Escalate repetitive problems to higher management levels for action.

Finding O-3

Inconsistencies in NQAM requirements have created unnecessary work, delayed work and created inconsistencies in site implementation of quality program requirements. Two examples are discussed below:

First, the NQAM, Part II, Section 2.1, Paragraph 4.1.1 states "Maintenance shall be initiated and/or documented by the use of a maintenance request (MR) form." Contrary to paragraph 4.1.1, paragraph 4.3.3 permits preventive maintenance to be performed either by the use of an MR or an implementing instruction. At SQN and BFN, regularly scheduled maintenance instructions are referenced in PM instructions and these PMs are initiated by an automated scheduling system without MRs. At WBN, MRs are required to initiate many regularly scheduled MIs and some other PMs, adding significantly to the effort required and apparently providing little added benefit.

Second, portions of the NQAM, Part II, section 2.1, require prior PQA review of MRs that initiate PORC-reviewed troubleshooting and corrective maintenance instructions. Another portion of the NQAM permits performance of an MR that initiates a Preventive

Maintenance Instruction (PMI) already approved by PQA without separate PQA approval of the MR. This is permitted even though the operability of a system or component may be affected. Since the NQAM has recognized that only one PQA review is necessary for PMIs, that logic also appears applicable to an MR that uses only PQA approved procedures that encompass all aspects of the job, including appropriate PMT requirements. It is not clear that PQA review of an MR is needed when the MR uses only PQA approved instructions. Such redundant reviews add unnecessarily to work and delays.

Recommendation:

Revise the NQAM to clarify requirements for advance PQA approval of maintenance work and implement uniform application of the requirements at all sites. Eliminate redundant PQA reviews such as those discussed in the finding. Consider a more comprehensive review of NQAM requirements relevant to maintenance to identify and eliminate inconsistencies and necessary requirements that can impede timely processing of maintenance work without adding significantly to quality. Involve maintenance and QA personnel in the review.

Finding O-4

Surveillance of maintenance activities by PQA at BFN and WBN is unnecessarily limited in scope and depth.

The surveillance program is intended to provide feedback to management on the implementation of applicable procedures and requirements through observation of activities in progress. At SQN, the surveillance program appears to be working effectively. At BFN and WBN, however, surveillance activities are often limited to review of paperwork and programmatic matters. Surveys have not been completed on an appropriate variety of maintenance activities to permit a meaningful overall assessment.

Browns Ferry

The 57 maintenance surveys done in 1985 were final data package reviews, workplan reviews and programmatic reviews. No surveys were performed on work activities. One survey, however, performed in 1986 did cover several actual work activities.

Watts Bar

Fourteen maintenance surveys were performed in 1985. Eleven of those were limited to reviews of completed MRs or EQ related programmatic issues. One was to document a condition noted during a rework activity. Two were field

surveys of activities that included document checks and the actual performances of work. Seven of eleven identified review guidelines for surveillance have not yet been written. They cover the following areas:

- Welding
- Equipment history/trending
- EQ implementation
- Preventive maintenance
- Housekeeping
- Maintenance of cranes and hoists
- Preventive maintenance instructions

Recommendation:

Strengthen the BFN and WBN PQA surveillance programs to place primary emphasis on surveillance of maintenance activities in progress. Strengthen surveillance expertise in the activities being observed and in observation techniques. Train PQA surveillance personnel in observation methods using the POTC course based on INPO techniques. At WBN, complete the surveillance review guidelines identified in the finding.

Answers to Questions Contained in S. A. White's Memorandum of April 10, 1986

A. 1 Are there procedures which clearly describe the entire process of accomplishing corrective maintenance?

With some exceptions, the administrative procedures for corrective maintenance provide adequate guidance.

Weaknesses in these administrative procedures include: (1) lack of guidance for specifying postmaintenance testing (see Finding I-1) and (2) lack of instructions and guidance for documenting maintenance history (see Finding N-1).

In addition, numerous instructions exist for specific corrective maintenance activities. These instructions sometimes do not clearly or completely describe the activities necessary. Examples include inadequate lubricant specification and excessive instruction referencing (see Finding F-2).

A. 2 Do the originators of MRs describe the problem area accurately, clearly, and in sufficient detail?

For the most part, yes. At each site, MRs can be initiated by any employee. As a result, the detailed problem description varies. Some discrepancies were identified and are discussed in finding N-1.

A. 3 Does the MR process keep the operations personnel informed of plant problems?

At each site the MR process keeps operations personnel informed of most plant maintenance problems. Plant maintenance problems are reported and tracked by the maintenance request system. Each site utilizes senior reactor operator (SRO) qualified individuals in the planning and scheduling unit who review submitted MRs and interface with operations for prioritization of MRs. Daily activity lists are provided to site personnel (including operations) to inform them of plant maintenance problems being actively worked. Also, most maintenance activities that affect plant equipment require that operations authorize starting the work and are notified upon completion of the work.

A. 4 Does the MR process allow for prioritization of work? Is the priority system based on equipment/system availability as well as the safety impact to the plant?

The MR process allows for prioritization and is based upon availability as well as safety impacts. The BFN, SQN and WBN prioritization processes all provide for "emergency", "immediate attention", and "routine" priorities. Emergency maintenance activities are those needed to prevent imminent equipment damage or imminent personal injury; they are worked immediately and interrupt lower priority work. Immediate attention activities are those required to be completed within 24 hours. At WBN, the routine priority is further divided into routine priority 1 for plant process equipment and routine priority 2 for non-process equipment. "Complete by" dates can be assigned to establish further priorities. At SQN, the routine priority for process equipment is divided into three subset priorities to be completed within 7 days, 21 days, and as work load permits. At BFN, there is no further prioritization within the routine category; see Finding H-2 for additional information.

A. 5 Does the MR process identify technical specifications limiting conditions for operation?

The MR process adequately identifies limiting conditions for operation (LCO). An SRO reviews MRs, determines if an LCO has been entered, determines if the needed maintenance will result in an LCO, and determines the actual time that an LCO was entered. The SROs are trained in the technical specification requirements and are qualified to make such decisions and judgements. At WBN, LCO requirements will not be fully implemented until an operating license is received.

A. 6 Is the work well planned and job stepped in a manner that is clearly understood in the field?

Maintenance work is planned and job stepped in a manner generally understood in the field. However, a number of weaknesses in implementation were observed which substantially and adversely impact the quality of the final work package. The principal weaknesses observed are: (1) more reliance is placed on the "skill of the craft" than appropriate in some detailed work instructions and clear descriptions of the skills of all assigned craft workers do not exist, (2) generic work instructions that do not address the important details of the job are frequently referenced in work packages (see Findings F-1 and F-2), (3) interdisciplinary craft work and support activities are often not well coordinated and unnecessary delays in performing maintenance result (see Finding G-1).

A. 7 Is the work scheduled in conjunction with other work to minimize equipment and system downtime?

Some attempts are made to schedule related corrective maintenance MRs on the same piece of equipment together. At BFN, means have been established to identify all outstanding work on any given

equipment as that scheduling can be coordinated. With this exception, however, all three sites rely heavily on personnel in the planning and scheduling sections to recognize the opportunity to coordinate scheduling to minimize downtime. As expected, this system is only marginally effective (see Finding G-4).

A. 8 Is the process from problem recognition to corrective action implementation timely and efficient?

No, the process from problem recognition to corrective action is often neither timely nor efficient. There is a substantial backlog of open MRs at the plants. Major contributors to the age of open MRs are the lack of materials (see Finding J-4) and the need for minor modifications (see Finding H-1).

At BFN, there were approximately 4300 open MRs with an average age of six months. At WBN, there were 2,800 MRs open, of these, 35 percent were over sixty days old. At SQN, there were approximately 2,400 open items (MRs and WRs).

Efficiency problems include delays in obtaining parts (see Findings J-1, J-2, and J-4), scheduling (see Findings G-1, and G-4), and manpower utilization (see finding H-4).

A. 9 Are plans/procedures in place to handle repairs and replacements under ASME? Do maintenance personnel understand the requirements for repair and replacement?

Plans/procedures are in place to handle repairs and procedures under the applicable ASME codes. Personnel responsible for implementation have been given training and appear to be knowledgeable. However, procedures rely heavily on knowledge and interpretations of ASME code requirements by implementing personnel. They indicated that periodic retraining by corporate engineers active in code activities would help ensure that ASME code requirements are properly interpreted.

A.10 Do maintenance personnel understand the other requirements for Section XI such as LLRT [Local Leak Rate Test], ILRT [Integrated Leak Rate Test], and operability? Do they understand the impacts of types of work that will require re-testing under the code?

Site personnel appear to have a good understanding of what types of work would require retesting under Section XI of the code. However, the following exception was noted. At BFN, electrical work associated with an active valve was conducted without initiation of active valve operability testing.

A.11 Do maintenance personnel have a basic understanding of the plant equipment and systems to ensure they are aware of the importance or safety impacts of their work?

Maintenance personnel generally had an adequate understanding of plant equipment and systems and were adequately aware of the importance and impact of their work.

Maintenance personnel receive training in basic plant systems, Boiling Water Reactor (BWR) or Pressurized Water Reactor (PWR) technology courses, and training courses on specific equipment as appropriate.

A.12 How are code repairs and replacements handled? Do they ensure updating of the design documents, required ANI [Authorized Nuclear Inspector] interfaces, and NIs [Nuclear Inspectors] 2/1 form preparation, approval, and submittal?

Site administrative instructions or standard practices address the needed programmatic steps for Section XI Repair and replacement activities. These steps including updating of design documents, inspections, interfacing with the ANI, and providing input data to the corporate office for NIs 2/1 submittals.

No administrative instructions/standard practices were found which address repair and replacements for American National Standards Institute (ANSI) B31.1 code components (non-safety related).

A.13 Are there processes in place to ensure that environmental or seismic qualifications of equipment are not breached during corrective maintenance? Do maintenance personnel understand EQ and SQ [Seismic Qualification]?

Yes, processes for EQ and SQ are in place with one technical exception noted.

At WBN, the instrument supervisor felt seismic considerations were adequately addressed with the exception of instrument mountings (including torquing requirements). Engineering is presently developing standard drawings to address requirements for instrument mountings. Those were expected to be in place by July 1, 1986.

Maintenance personnel appear to understand their respective roles for EQ and SQ applications.

A.14 a. How are problems handled during the implementation of corrective maintenance?

b. Is this process timely?

Minor problems are routinely resolved by the involved foremen, craft or engineers. Examples of minor problems are coordination delays or those not requiring work package revision. Any problems beyond those minor ones result in inordinate work delays from generating new MRs and replanning existing MRs (see Finding H-5).

A.15 Are the corrective actions taken well documented? Do they reflect all steps taken and conditions found as well as left?

Although there is a high degree of variability in the detailed documentation of the corrective action and the steps taken, the general performance in this area needs improvement. If a

procedure with step-by-step signoff is used, the work is so documented. The descriptive portions of many completed MRs (work performed and failure cause) do not clearly reflect the work done in a manner that provides meaningful information for maintenance history. See Finding N-1 for additional information.

A.16 Are MRs properly reviewed by supervision to ensure adequacy and accuracy?

Field complete MRs are reviewed to assure that the blanks are filled in and that the data is accurate. However, the reviews were not adequate in: (1) the description of work performed, and (2) the cause of the failure. In addition, there was not sufficient review to conclude that the problem identified by the originator was actually corrected (see Findings H-3 and N-1). SQN, however, showed significant improvement in May in the number of completed MRs (supervisor reviewed) rejected by PQA. This number was down to 3 percent from about 50 percent.

A.17 Do MRs provide enough information to allow for trend analysis, traceability to other documents, and spare parts of materials?

a. Trend analysis: No; MRs often do not contain adequate information to perform a useful trend analysis. In order to recognize an adverse trend (i.e. significant repeated problems or failures) from MR data, the evaluator would have to know substantially more than is normally included on MRs (see Finding N-1).

b. Traceability to other documents: Yes, references to other documents on MRs are adequate.

c. Spare parts or materials: Yes; traceability to Material Requisition Forms (TVA form 575) was consistently included on MRs when parts were used.

A.18 Is there a trend analysis program? How adequate is it?

Trend analysis programs are being developed for all three sites. As these programs have only been recently implemented at SQN and BFN, judgement on the adequacy of the programs could not be made. Problems with data collection (see Finding N-1) and failure analysis (see Finding A-4) were noted, other information is as follows:

Browns Ferry

An item for which three MRs are written within 90 days in any one unit is flagged by the computer for analysis. This threshold does not include MRs for like items in the other two units.

Sequoyah

The plant procedure identifying the overall program appears to be well defined. However, the current program has only been recently implemented, and its adequacy could not yet be determined.

Watts Bar

There is not an effective trend analysis or equipment history program in use. EQIS and the site maintenance history programs are fully functional but are not frequently used. The vibration group and the instrumentation maintenance unit have trending programs for their specific areas. Repetitive failures and equipment that requires excessive corrective maintenance are not effectively tracked, trended, or flagged.

A.19 What is QA's involvement in corrective maintenance?

At all three sites PQA reviews all CSSC/Safety Related MRs prior to performance of the work. This review checks items such as:

1. Identification of the equipment
2. Work instructions
3. Designation of QC holdpoints
4. Postmaintenance testing requirements
5. Administrative and section reviews

In addition, PQA at SQN reviews all completed CSSC MRs.

The PQA surveillance groups perform specific and programmatic surveys of randomly selected maintenance activities and related documentation. These surveys are intended to point out the effectiveness of plant procedures and adherence to them. For problems related to PQA surveys, see Finding O-4.

PQA also reviews and approves maintenance instructions and revisions for technical content, QC holdpoint designation, and clarity prior to use. For problems relating to PQA review, see Findings O-1 and O-3.

PQA also participates directly in the CM process through inspections at designated QC holdpoints.

A.20 Can corrective maintenance be performed by anyone other than personnel assigned to the maintenance group? If so, who and under what conditions and controls?

Corrective maintenance can be performed by organizations other than the maintenance group as follows:

The TVA modifications group occasionally has performed corrective maintenance using MRs.

The TVA Service Shop in Muscle Shoals, Alabama, performs maintenance on large equipment and motors and rebuilds contaminated motors using procedures provided with each job. Muscle Shoals is bound by the requirements in the NQAM. They also filter (Purevac) the oil in transformers and switch gear in the switch yard at the sites.

Contractors, such as Combustion Engineering, perform some CM on site. Their performance is controlled by contractor procedures written to satisfy the contract work specificiation.

Some instruments and electrical components are sent back to the manufacturer for repair in accordance with specifications in the contract.

A.21 Is there an effective system for flagging MR backlogs?

At all three sites, the backlog of MRs (number of MRs) is routinely identified. However, this information does not represent the backlog of corrective maintenance activities. The backlog of MRs may include the following, depending on which site the data is for:

(a) Corrective Maintenance
(b) Preventive Maintenance
(c) Maintenance support for activities such as SIs, refueling activities, and modifications
(d) Support activity (disconnecting leads, erecting scaffolds, installing temporary lighting) to support the corrective maintenance activity.

Furthermore, the MR backlog is not identifiable in estimated man-hours at SQN or WBN.

B. 1 Are there procedures which clearly describe the entire process of accomplishing preventive maintenance?

Yes. Procedures have been developed for the PM program. Some PM activities, however, are not within the PM program proper and are controlled by other procedural systems. IMIs, some MIs, and predictive maintenance activities are examples of these other activities. Since PM activities are controlled under a variety of different programs, controls over scheduling and performance of activities are different. For example, approval of waivers, deletions, additions or changes in performance frequency are controlled at different management levels. More uniform controls are warranted (see Finding E-2).

B. 2 What mechanism is used to ensure that all equipment has been evaluated for preventative maintenance requirements?

There is not an adequate mechanism at any of the sites to ensure that all equipment necessary for safe and reliable operation is included in the PM program (see Finding E-1).

B. 3 Are manufacturers' recommendations followed? If not, what process has been used to determine requirements?

Manufacturers' recommendations are considered in the establishment of PMs. However, vendor PM recommendations have not been uniformly implemented, and variations from these recommendations have not been well documented (see Finding E-1).

B. 4 Has an engineering or plant technical evaluation been performed and documented for deviations from vendors' requirements on safety related equipments?

No, deviations from vendor recommendations have not been well documented (see Finding E-1).

B. 5 Does the PM system satisfy the requirements necessary to maintain equipment's environmental and seismic qualifications?

Yes. Seismic qualification is maintained primarily through configuration control of maintenance activities and use of appropriately qualified replacement parts.

Environmental qualification is maintained through PM activities that replace parts before the end of qualified life, use 50.49 qualified replacement parts, and appropriately update the qualification data when replacement parts are used.

B. 6 How was the frequency for PMs established? Is it based on time or running hours? Does equipment in the plant have installed hour meters?

The frequency of PMs is established using vendor recommendations, plant specific failure data or engineering judgment. The recent changes in maintenance organizations at WBN and SQN have coupled the responsibility for evaluation of the frequency of PM activities with the responsibility for trend analysis.

Normally the frequencies of PMs are based on time instead of running hours, because run time meters are not installed on most equipment and running times are not tabulated on most equipment.

B. 7 Is there a lubrication manual which describes the type and specification of lubricants for equipment? Is this document controlled and does it follow vendors' requirements?

The TVA Lubrication Manual is a controlled document used at each of the plant sites. The TVA Lubrication Manual provides a listing of equivalent lubricants that satisfy specific TVA lubricant requirements. It does not identify the application of lubricants to plant equipment.

Browns Ferry

No lubrication instruction exists that lists the lubricants to be used on specific equipment in the plant. Individual plant instructions control the lubrication program. Lubrication is included in the regular PM program, and PM instructions specify adequately the lubricants to be used.

Sequoyah

No lubrication instruction exists that lists the lubricants to be used on specific equipment in the plant. Lubricants are generally specified in equipment-specific MIs and PMs based on vendor manuals. Operations personnel stated they use a computerized, uncontrolled index dated January 20, 1984 to determine the type of oil to be added to non-CSSC equipment and, on an emergency basis, to CSSC equipment. The computer data base used to generate this index has since been erased.

Watts Bar

WBN Standard Practice WB 7.3.1, "Lubrication," lists the lubrication requirements of plant equipment. Discrepancies were identified between PM packages and the standard practice. In these cases, the PM packages were found to be consistent with vendor recommendations and were followed, as appropriate.

B. 8 Are PMs scheduled in conjunction with other work to minimize equipment and system downtime?

PMs are generally not scheduled in conjunction with other maintenance work at SQN and WBN. However, a computer-assisted program is used at BFN to identify PM's that can be scheduled with other work. See Finding G-4.

B. 9 How are discrepancies discovered during preventive maintenance identified and corrected?

MRs are prepared to identify the hardware deficiencies discovered during PM and the deficiencies are resolved as CM.

B.10 What is the percentage of PMs that are overdue and are they judged to be mandatory or "nice to do"?

The percentage of overdue PMs (both CSSC and non-CSSC) for March, April, and May, 1986 is as follows:

BFN - 21%
SQN - 16%
WBN - 16%

The overdue PMs represent the number of PMs not performed and not receiving management approval for waiver.

There is no classification at any of the sites which categorizes or prioritorizes the performance of PMs. SQN has a mandatory category for PMs needed to meet regulatory requirements, but this category is not reflected in the PM packages or the tracking system (see related Findings E-5 and H-2).

B.11 What mechanism is used to handle daily PM items such as checking lubricant levels? Is it adequate?

Daily PM activities such as inspections or simple operational activities (checking lubrication levels, cycling drain valves, checking filter cleanliness, etc.) are controlled by section letters. These activities are typically performed by an Assistant Unit Operator on a shift basis. Completion is documented on forms in the applicable section letter. This method appears to be effective.

B.12 Are work descriptions and work performed sections of PMs clear and accurate? Is work reviewed by supervision to ensure adequacy and accuracy?

The required work descriptions were found to be generally clear and adequate. However, several PMs at SQN lacked needed detail; examples included failures to specify the type of lubricant and method of lubricating. The lack of detail resulted in inefficient performance of the PMs, with craftman's time required to check vendor's manuals.

B.13 Is the scheduling mechanism for PMs adequate and does it ensure jobs will not be forgotten or dropped?

All three plant sites have adequate scheduling and tracking mechanisms for PMs. Overdue PMs are tracked until performed or waivered.

B.14 Is there a priority system for PMs to ensure that the most critical items are performed first? Is there a system to ensure that PMs associated with safety related equipment are mandatory?

There is no formal priority system established to ensure critical items are performed first. First line supervisors responsible for performing the PMs are allowed to establish daily and/or weekly work priorities utilizing PM work lists provided to them. However, based on the observed completion performance, important PMs are receiving appropriate attention.

There is no formal system established to ensure that performance of PMs associated with safety related equipment is mandatory. The system relies upon review and approval of PM waivers and deferrals by maintenance management to ensure performance of PMs on safety related equipment when appropriate.

B.15 Is there a process in place to perform PMs such as infra-red for electrical hotspots, dobel testing, heat loss through insulation, vibration analysis, lubrication analysis, equip/system efficiency, etc.?

The specific processes identified were found to be in place at the sites with the exception of heat loss through insulation. Additional predictive techniques, such as gas in oil analysis for electrical equipment, MOVATS (Motor Operated Valves Automated Test System) testing of motor operated valves, and motor insulation integrity testing, are also being utilized. However, these are not considered by the sites to be a part of the PM program (see Finding A-3).

B.16 What involvement does QA have in preventative maintenance?

At all three sites PQA reviews and approves SIs and preventative maintenance instructions and revisions prior to work. At WBN, PQA also reviews some MRs which are used to initiate PMs (see Finding F-5).

The PQA surveillance groups perform and programmatic surveys of randomly selected PM activities. Though these surveys are intended to point out the adequacy of plant procedures and procedural adherences, they are not fully effective (see Finding O-4).

Specific PQA involvement at the sites varies as follows:

At BFN, QA reviews of completed SIs and PMs are done on a random basis by the surveillance group.

At SQN, QA reviews all of the the completed PM data packages. They also review all of the completed SIs related to Technical Specifications.

At WBN, QA reviews of completed SIs and PMs are done on a random basis by the surveillance group. However, QC reviews all completed SI data packages.

B.17 Is there an effective system for flagging overdue PMs?

Yes, each site has an effective system for flagging overdue PMs. BFN and SQN utilize a computer system to identify overdue PMs and provide a management summary. WBN utilizes a word processing system to identify overdue PMs. Management summaries are developed manually.

Follow-up on Nuclear Safety Review Staff Report R-85-03-NPS, "Review of Nuclear Power Maintenance Program"

The open NSRS items associated with report R-85-03-NPS were reviewed during this maintenance review. Sufficient information was obtained to determine that: (1) the corrective action was adequate and the item is closed or (2) the condition continues to exist. In the latter case, a new finding has been written and included in this report. Only one item, R-85-03-NPS-07 at BFN and WBN, requires additional evaluation to determine whether or not the stated corrective action has been effective. Disposition of the open items from report R-85-03-NPS are as follows:

R-85-03-NPS-02, Improper Identification of CSSC Equipment on Maintenance Requests - Watts Bar Nuclear Plant (WBN)

Training to meet a commitment to NSRS was completed by WBN on June 28, 1985. Since that date, new planners have been placed in the maintenance sections and are responsible for identifying CSSC vs non-CSSC equipment. Though those planners have not received the structured training recommended in R-85-03-NPS-02, and excessive effort was required to make proper identifications (see finding G-6), no errors were observed in the classification of MRs. This item is closed.

R-85-03-NPS-03, Inadequate Postmaintenance Testing of CSSC Equipment on Maintenance Request (MR) - Browns Ferry Nuclear Plant (BFN)

Although this item has not been satisfactorily resolved, R-85-03-NPS-03 is closed for record purposes. This problem is addressed in finding I-1 of this report.

R-85-03-NPS-05, ASME Section XI Postmaintenance Valve Testing - WBN

Although this item has not been satisfactorily resolved, R-85-03-NPS-05 is closed for record purposes. Postmaintenance testing is addressed in finding I-1 of this report.

R-85-03-NPS-06, Postmaintenance Testing Program - Generic

Although this item has not been satisfactorily resolved, R-85-03-NPS-06 is closed for record purposes. The Postmaintenance Testing Program is addressed in finding I-1.

R-85-03-NPS-07, Common Mode Failure - Generic

At BFN and WBN, procedures changes were made to correct the identified problem. Additional review is necessary to determine the effectiveness of that corrective action. This item remains open pending that review.

At SQN NSRS Review R-86-01-SQN evaluated the adequacy of the corrective action including training provided to foreman. That review identified two additional changes to Mechanical Maintenance Section Letter-A36 needed to fully satisfy the intent of that recommendation. Those changes have been made and this item is closed for SQN.

R-85-03-NPS-08, Quality Assurance Surveillance of Maintenance Program - Generic

At all three sites PQA procedures had been revised to include surveillances of maintenance activities including PMT and common mode failure.

At BFN checklists were prepared for surveillance; however, no surveys had been performed. Although this item has not been satisfactorily resolved, R-85-03-NPS 08 is closed at BFN for record purposes. Subsequent action on this item will be tracked through finding 0-4 of this report.

At SQN NSRS Review R-86-01-NPS determined only additional procedural changes need be made. Those changes were made and this item is closed for SQN.

At WBN maintenance surveys were being performed, but were predominately documentation surveys. This item has not been satisfactorly resolved at WBN but R-85-03-NPS-08 is closed for record purposes. Subsequent action on this item will be tracked through finding 0-4 of this report.

ACRONYMS USED IN THIS REPORT

ANI	Authorized Nuclear Inspector
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BFN	Browns Ferry Nuclear Plant
BWR	Boiling Water Reactor
CAR	Corrective Action Report
CFR	Code of Federal Regulations
CM	Corrective Maintenance
CSSC	Critical Systems, Stuctures, and Components
DCR	Design Change Request
DNE	Division of Nuclear Engineering
DNQA	Division of Nuclear Quality Assurance
DPSO	Division of Power System Operations
DR	Discrepancy Report
ECN	Engineering Change Notice
EQ	Equipment Qualification
EQIS	Equipment Information System
ERCW	Essential Raw Cooling Water
FCR	Field Change Request
HPCI	High Pressure Coolant Injection
IE	Industrial Engineering
ILRT	Integrated Leak Rate Test
IMI	Instrument Maintenance Instruction
INPO	Institute of Nuclear Power Operations
ISI	In-Service Inspection
LCO	Limited Condition for Operation
LER	Licensee Event Report
LLRT	Local Leak Rate Test
M&AI	Modifications and Additions Instruction
MAMS	Materials Management System
MI	Maintenance Instruction
MOVATS	Motor-Operated Valves Automated Test System
MR	Maintenance Request
N/A	Not Applicable
NI	Nuclear Inspector
NMRG	Nuclear Manager's Review Group
NPOSS	Nuclear Plant Operational Support Systems
NPRDS	Nuclear Performance Reliability Data System
NQAM	Nuclear Quality Assurance Manual
NRC	Nuclear Regulatory Commission
NSRS	Nuclear Safety Review Staff
NUMARC	Nuclear Utility Management and Human Resources Committee
ONP	Office of Nuclear Power
P&S	Planning and Scheduling
PM	Preventive Maintenance
PMI	Preventive Maintenance Instruction
PMT	Postmaintenance Testing
PORC	Plant Operating Review Committee

ACRONYMS USED IN THIS REPORT

POTC	Plant Operations Training Center
PQA	Plant Quality Assurance
PWR	Pressurized Water Reactor
QA	Quality Assurance
QC	Quality Control
RCW	Raw Cooling Water
RWP	Radiation Work Permit
SEE-IN	Significant Event Evaluation and Information Network
SI	Surveillance Instruction
SQ	Seismic Qualification
SQN	Sequoyah Nuclear Plant
SRO	Senior Reactor Operator
TACF	Temporary Alteration Control Form
TIIC	TVA Item Identification Code
TVA	Tennessee Valley Authority
WBN	Watts Bar Nuclear Plant

TVA 64 (OS-9-65) (OP-WP-5-65) A02 860410 010

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

TO : R. K. Seiberling, Manager, Nuclear Manager's Review Group, E3 A8 C-K

FROM : S. A. White, Manager of Nuclear Power, LP 6N 38A-C

DATE : April 10, 1986

SUBJECT: TASKS FOR THE NUCLEAR MANAGER'S REVIEW GROUP (NMRG)

I request that the NMRG conduct a comprehensive review of corrective and preventive maintenance at Browns Ferry, Sequoyah and Watts Bar Nuclear Plants.

It is my intent to restructure the maintenance activities throughout TVA's nuclear program. In order to do this effectively, I need an objective assessment of the current practices at the two operating sites and at Watts Bar. Based on the results of this assessment, new procedures will be written, organizational structures may be realigned, and the current effort to rewrite all position descriptions will be significantly affected.

Please have this review completed no later than June 15, 1986, and provide me with a written report of your findings at that time. Because of the importance and magnitude of this task, I expect most of the resources of the NMRG will be required. Please advise me of your assessment of the manpower requirements as soon as possible.

As a mininum, the following questions should be addressed, as appropriate, at all three sites.

A. Corrective Maintenance

1. Are there procedures which clearly describe the entire process of accomplishing corrective maintenance?

2. Do the originators of MRs describe the problem area accurately, clearly, and in sufficient detail?

3. Does the MR process keep the operations personnel informed of plant problems?

4. Does the MR process allow for prioritization of work? Is the priority system based on equipment/system availability as well as the safety impact to the plant?

5. Does the MR process identify technical specifications (limiting conditions for operation)?

6. Is the work well planned and job stepped in a manner that is clearly understood in the field?

R. K. Seiberling
April 10, 1986

TASKS FOR THE NUCLEAR MANAGER'S REVIEW GROUP (NMRG)

7. Is the work scheduled in conjuction with other work to minimize equipment and system downtime?

8. Is the process from problem recognition to corrective action implementation timely and efficient?

9. Are plans/procedures in place to handle repairs and replacements under ASME? Do maintenance personnel understand the requirements for repair and replacement?

10. Do maintenance personnel understand the other requirements for Section XI such as LLRT, ILRT, and operability? Do they understand the impacts of types of work that will require retesting under the code?

11. Do maintenance personnel have a basic understanding of the plant equipment and systems to ensure they are aware of the importance or safety impacts of their work?

12. How are code repairs and replacements handled? Do they ensure updating of the design documents, required ANI interfaces, and NIS 2/1 form preparation, approval, and submittal?

13. Are there processes in place to ensure that environmental or seismic qualifications of equipment are not breached during corrective maintenance? Do maintenance personnel understand EQ and SQ?

14. a. How are problems handled during the implementation of corrective maintenance?

    b. Is this process timely?

15. Are the corrective actions taken well documented? Do they reflect all steps taken and conditions found as well as left?

16. Are MRs properly reviewed by supervision to ensure adequacy and accuracy?

17. Do MRs provide enough information to allow for trend analysis, traceability to other documents, and spare parts of materials?

18. Is there a trend analysis program? How adequate is it?

19. What is QA's involvement in corrective maintenance?

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13. Is the scheduling mechanism for PMs adequate and does it ensure jobs will not be forgotten or dropped?

14. Is there a priority system for PMs to ensure that the most critical items are performed first? Is there a system to ensure that PMs associated with safety related equipment are mandatory?

15. Is there a process in place to perform PMs such as infra-red for electrical hotspots, dobel testing, heat loss through insulation, vibration analysis, lubrication analysis, equip/system efficiency, etc.?

16. What involvement does QA have in preventive maintenance?

17. Is there an effective system for flagging overdue PMs?

Original signed by
S. A. White

SAW:JM
Attachment
cc (Attachment):
RIMS, MR 4N 72A-C

At least a quarter of the corporate managers interviewed stated they did not have a clear understanding of their role in maintenance. Those managers appear in the organization chart from the group head level to the division director level, and all appear to have significant maintenance support roles. Since the change away from the owner-operator concept, the roles of several corporate organizations for support and coordination of maintenance have not been clearly defined. Some managers have attempted to define their roles through interpretation of the Nuclear Performance Plan.

Recommendation:

Strengthen the corporate involvement in maintenance by appointing a senior level manager, experienced in maintenance, to direct and coordinate TVA's nuclear maintenance program. Assign that person appropriate responsibility, authority, and organizational position to permit effective establishment of needed policies, directives, and standards governing maintenance efforts. Use this position to promote development and use of common maintenance management and monitoring programs at the nuclear sites, and strengthen the corporate role in directing, supporting, and coordinating human resource management efforts in the maintenance area. Involve knowledgeable site personnel in efforts aimed at standardizing maintenance management methods to help ensure that revised programs function effectively.

Finding A-2

Performance indicators used to gauge the effectiveness of Preventive Maintenance and Corrective Maintenance activities at the sites are not representative of the actual effort expended or as useful as possible. Differences in maintenance work classification at the three sites produce indicators that cannot be easily or meaningfully compared between sites, combined to reflect overall Tennessee Valley Authority (TVA) performance or compared with the industry performance indicators collected by INPO. These indicators are used at the sites and in monthly reports to the corporate office.

The scope of activities considered to be PMs is not completely or uniformly defined at the sites. Examples of PM activities not reported in performance monitoring data bases include predictive analysis, Division of Power System Operations (DPSO) testing and calibrations, and (at WBN) some periodic instrument calibrations.

Though the number of Maintenance Requests (MRs) at each site is monitored and reported to reflect the magnitude of the maintenance effort, that number is not representative of the CM effort on process equipment and does not fit the scope preferred by INPO. MRs are used to request CM and also to authorize a variety of other work. Examples of other uses for MRs include PMs at WBN, work on non-process equipment, and requesting maintenance personnel support for activities such as Surveillance

in-plant warehouse and replenishing as needed from base stocks outside. Tailor these changes toward reducing delays in providing material to requisitioners and permitting replenishment of in-plant stock on a schedule convenient to stores personnel.

Finding J-4

At SQN, numerous maintenance activities are being unnecessarily delayed for lack of needed materials. Approximately 250 MRs are on material hold. The examples discussed below are representative of problems throughout the entire procurement process.

Some procurements were found to be delayed as a result of the onsite review process.

- An emergency request for refueling equipment parts was initiated on October 22, 1985 but the requisition was not released from the site until December 30, 1985.

- A request for a part for a pressurizer safety valve was initiated on September 4, 1985, with a need date of March 1986 to support a modification. The materials unit approved the request on November 9, 1985; QA approved the request on November 26, 1985; and the requisition was initiated by Power Stores on February 4, 1986.

Significant delays have also occurred after requisitions have been issued. The following material had not been received as of the middle of June 1986:

- A motor requisitioned in December 1985.

- Four pole blocks and plugs requisitioned in November 1985.

- A brake coil requisitioned in September 1985.

- A motor starter requisitioned in November 1985.

- Indicating light holders and lenses requisitioned in December 1985.

- Switches requisitioned in September 1985.

- Indicator lights with transformers requisitioned in April 1985.

- A capacitor and resistor requisitioned in October 1985.

Although this issue was not specifically reviewed at WBN and BFN, between 200 and 300 MRs are on material hold at each of those sites. At BFN, about one third of those were over six months old. This finding is considered applicable to all sites.

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20. Can corrective maintenance be performed by anyone other than personnel assigned to the maintenance group? If so, who and under what conditions and controls?

21. Is there an effective system for flagging MR backlogs?

B. Preventive Maintenance

1. Are there procedures which clearly describe the entire process of accomplishing preventive maintenance?

2. What mechanism is used to ensure that all equipment has been evaluated for preventive maintenance requirements?

3. Are manufacturers' recommendations followed? If not, what process has been used to determine requirements?

4. Has an engineering or plant technical evaluation been performed and documented for deviations to vendors' requirements on safety related equipment?

5. Does the PM system satisfy the requirements necessary to maintain equipments' environmental and seismic qualifications?

6. How was the frequency for PMs established? Is it based on time or running hours? Does equipment in the plant have installed hour meters?

7. Is there a lubrication manual which describes the type and specification of lubricants for equipment? Is this document controlled and does it follow vendors' requirements?

8. Are PMs scheduled in conjunction with other work to minimize equipment and system downtime?

9. How are discrepancies discovered during preventive maintenance identified and corrected?

10. What is the percentage of PMs that are overdue and are they judged to be mandatory or "nice to do"?

11. What mechanism is used to handle daily PM items such as checking lubricant levels? It is adequate?

12. Are work descriptions and work performed sections of PMs clear and accurate? Is work reviewed by supervision to ensure adequacy and accuracy?