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

Report Nos. 50-325/92-04 and 50-324/92-04

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket Nos. 50-325 and 50-324 License Nos. DPR-71 and DPR-62

Facility Name: Brunswick 1 and 2

Inspection Conducted: February 17 - March 27, 1992

Lead Inspector: _____ 4/27/92
D. J. Nelson, Resident Inspector Date Signed

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SUMMARY

Scope:

Since mid 1990, six escalated enforcement issues have occurred in which inadequate work control was a major contributing cause. The Maintenance/Surveillance functional area decreased from a 2 (Improving) rating to a 3 rating in the Systematic Assessment of Licensee Performance cycle completed on November 2, 1991.

This special inspection by the resident inspector involved the area of work control. This inspection was a work control program review utilizing current and previous work control events.

For the purpose of this inspection, work control is defined as follows: work control is primarily a management process to control various aspects of individual work activities. The desired result is that maintenance, modification, and surveillance activities are thoroughly planned, properly executed, and verified complete.

Results:

One violation was identified for failure to perform a safety evaluation in accordance with 10 CFR 50.59 and for failure to perform an ASME code required test after notified by the inspector. (paragraph 10.b)

One deviation was identified for failure to complete corrective actions with regard to post maintenance testing. (paragraph 9.)

Station management was ineffective in implementing corrective actions for recognized problems in the work control processes. (paragraph 2.)

The high emergent work volume has caused loss of the ability to plan work by supervisors (paragraph 4).

Recommendations contained in a 1987 study and actions for IAP (Integrated Action Plan) Item D2.2 have not been effective in solving long standing planning deficiencies. (paragraph 3.)

Lack of a sophisticated scheduling mechanism allows inefficiencies to disrupt work flow and inhibits the maintenance staff in performance of corrective maintenance. (paragraph 4.)

Maintenance work procedures contain numerous deficiencies which contribute to a general irreverence towards procedural compliance. (paragraph 5.)

The Quality Control organization has begun to provide a valuable tool for determining the extent of work control weaknesses including improved identification of procedural problems. Craft personnel demonstrated a positive attitude towards involvement of Quality Control during routine maintenance activities. (paragraph 6.)

The closure process of maintenance activities is cumbersome and not reliable. (paragraph 7.)

The Maintenance organization training function was being reviewed by the licensee in parallel with implementation of major training facility upgrades. Formal training in work control attributes is insufficient. (paragraph 8.)

Post Maintenance Testing has serious programmatic deficiencies that have not been corrected despite the existence of an IAP item, previous regulatory attention, and Corrective Action Program involvement. (paragraph 9.)

In addition to process deficiencies directly related to the work control mechanism, deficiencies also exist in support-type processes such as clearances. (paragraph 10.)

Fundamental concepts of work control are not well understood by plant personnel. (paragraph 12.)

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*K. Ahern, Manager - Operations
*H. Beane, Manager - Quality Control
*M. Bradley, Manager - Brunswick Assessment Project
*J. Brown, Manager Engineering Support
*S. Callis, On-Site Licensing Engineer
*S. Floyd, Manager - Regulatory Compliance
*K. Godley, Manager - Regulatory Programs
*R. Helme, Manager - Technical Support
*J. Holder, Manager - Outage Management & Modifications (OM&M)
B. Leonard, Manager - Training
*D. Moore, Manager - Maintenance
*R. Morgan, Acting General Plant Manager - Brunswick Steam Electric Plant
*M. Oates, Manager - Licensing
R. Poulk, Manager - License Training
*D. Quidley, Chairman - Site Work Force Control Group
*R. Richey, Vice President - Harris Nuclear Project
*C. Robertson, Manager - Environmental & Radiological Control
*J. Simon, Manager - Operations Unit 1
*R. Starkey, Vice President - Brunswick Nuclear Project
*R. Tart, Manager - Operations Unit 2
*G. Warriner, Manager - Control and Administration
*K. Williamson, Manager - Nuclear Engineering Department (Onsite)

Other licensee employees contacted included maintenance supervisors, craftsmen, engineers, technicians, operators, and office personnel.

NRC Personnel

*P. Byron, Resident Inspector
*R. Carroll, Project Engineer, RII
*A. Gibson, Director, Division of Reactor Safety, RII
*G. Lainas, Assistant Director for Region II Reactors, NRR
*N. Le, Project Manager, NRR
*R. Prevatte, Senior Resident Inspector

*Attended the exit interview

2. Work Control Program

Station management was ineffective in implementing corrective actions for recognized problems in the work control processes.

The inspectors reviewed the licensee's maintenance procedures that govern the work control process. These are OMMM-001, Maintenance: Conduct of

Operations, Revision 17; OMMM-003, Corrective Maintenance (Automated Maintenance Management System, AMMS), Revision 13; and OMMM-004, Preventive Maintenance, Revision 5. Interviews were conducted with various plant personnel including maintenance management, maintenance supervisors, maintenance mechanics and technicians and representatives of Operations and the Site Work Force Control Group (SWFCG).

In December 1991, Maintenance management initiated an internal review of the work control process and was supported by corporate Nuclear Engineering Department (NED), as well as by internal maintenance personnel. This review resulted from the continuing work control problems occurring on site. At the close of the inspection period, this review was still in progress. The inspectors interviewed the program reviewers and reviewed preliminary results. Based on the preliminary results, the inspectors considered the work control process review to be detailed and rigorous. Apparent to the licensee reviewers were the numerous detailed requirements in the work process procedures for individual maintenance activities at different phases of the process. The reviewers stated that these detailed requirements were often associated with corrective actions for specific events that have accumulated over the years. This results in unnecessary inefficiencies in the work flow and an inordinate amount of paperwork. Examples of unnecessary paperwork for maintenance foremen and first line supervisors included: WR/JO (work request/job order) transmittals - preparing the final work package for document control; Calibration Non-Conformance Action Forms - trending out-of-calibration data for safety-related instrumentation; and Preventive Maintenance (PM) Exception Forms - rescheduling PMs, many of which are periodically scheduled when unit operation prevents their performance. The later requires up to five signatures. The reviewers considered that these tasks could be performed by others or avoided. For example, WR/JO transmittals could be made by clerks. Instrumentation trending, perhaps, should be a Technical Support function. Rescheduling PMs that should not have been scheduled originally could be managed prior to progressing to the foreman/supervisor level.

Lack of effective supervisory oversight of maintenance activities contributed to previously identified work control deficiencies. The above inefficiencies and excessive paperwork represent obstacles to supervisors' effectiveness. The licensee's corrective actions for some previous work control related events included increasing supervisory presence with the work force in the field. Supervisors interviewed stated that excessive administrative tasks had limited the amount of time available for field supervisory oversight. The supervisors said that they had complained about this in the past when increased field observation was stressed, but no changes came about. However, they also stated that recently their complaints are being heard and, in fact, Maintenance management has solicited their complaints. This indicates a potential for improvement. However, the fact that these complaints were voiced in the past with no resultant changes, indicates that station management was ineffective in implementing corrective actions.

3. Planning

Recommendations contained in a 1987 study and actions for IAP Item D2.2 have not been effective in solving long standing planning deficiencies.

The Maintenance Planning section develops work requests from the identified deficiency to an acceptable work plan that can be taken into the field by the site work force. There appeared to be many program deficiencies in this area that inhibited the planners from providing a quality product. These deficiencies are described below.

The planners have not been provided with specific guidelines and standards for producing a quality planning product. This has led to varying demands by the craft foremen. Since each craft foremen required different levels of detail in the WR/JO work instructions, the planners have had difficulty in providing a consistently acceptable product. This results in WR/JOs being returned to planning up to 75 percent of the time, or the craft foremen making the changes. The corrections to the WR/JOs increases the work load of the craft foremen, various reviewers, and planners.

The planner must determine In Service Inspection (ISI), Quality (Q) class, valve repair program, Environmental Qualification (EQ), and security classifications. Planners interviewed stated that they had not received training in these areas and that problems existed in the Engineering Data Base System (EDBS). The planners also stated that the EDBS computer system information for component classifications had not been verified for the primary/safety systems, that errors existed in the ISI and fire protection classifications, and that almost no information was available for the secondary plant.

The proper determinations for the various classifications can be very time consuming and require the planner to make technical judgements in areas that he has limited expertise.

During interviews, the planners stated that there has been no formal training on how to perform the planning function and very little training on usage of the computer systems. The various computer systems need software changes to make them more user friendly and this will reduce the amount of time spent by the planner. Various examples are as follows:

The AMMS system does not allow word processing changes to a previously processed WR/JO and this forces Quality Control (QC) hold points, ISI testing, and changes in work instructions to be hand written on the WR/JOs

Software changes are needed to allow for review and signature for QC, ISI, EQ and maintenance foreman prior to printing the planned WR/JO by the planner.

The EDBS computer information system is not complete. This requires the planner to spend excessive time researching technical manuals, procedures, drawings and design specifications for required information.

Obtaining the appropriate post maintenance testing requirement (PMTR) for PM activities is time consuming due to a needed software program change that would allow the planner to go from the PM screen directly to the PMTR screen.

These items are time consuming for the planner and also results in having write-in steps on the work request. If the review and signature process could be performed on the computer screen, the planner would not have the time consuming chore of hand carrying the printed WR/JO to various departments for review.

Emergent work is creating difficulties with the planning process because it places the planners on rotating shifts. When on shift, the planners have to provide a planned WR/JO for a different craft foreman and, because of differing expectations by craft foremen, an acceptable product maybe difficult to supply. Emergent work also forces an Instrumentation and Control (I&C) and a mechanical craft supervisor to be on shift to process emergent work tickets. The emergent work process results in the foremen being separated from their crews so they no longer have direct oversight of daily work activities. It also causes the planner/foremen interface to be broken and makes it more difficult to plan the WR/JO because they cannot communicate due to being on shift work.

The planners stated that system drawing files wer not sufficiently detailed and that they frequently had to go to document control to get appropriate drawings.

The priority system does not function efficiently because priorities above "4" have no special meaning for the staff. Various planners stated that planning was for some activities not performed by priority, but by which were easiest to plan because of the pressure to reduce the planning backlog.

The planners were writing detailed planning instructions which do not get the same management review as formal procedures. This may be partially caused by delayed procedure revisions which were estimated to comprise a one year backlog of greater than 2100 revisions. This backlog was exacerbated by having three site procedures for making procedure revisions.

The planners do not routinely get into the field to observe deficiencies as an aid in developing a quality planning product. Planners stated that this was prevented by the high planning workload.

The need for improvements in these and other planning areas was identified in an internal Maintenance Planner/Analyst Review completed in August 1987. This review was an in depth study of the planner functions and problems at that time. Recommendations addressed "potential enhancement opportunities in the areas of organization, training, systems and general planning. Several opportunities were also identified that involved the overall maintenance management system" at the plant.

These recommendations appear to have been the basis for IAP item D2.2, Strengthen Maintenance Planning Functions, formulated in late 1989. Specific actions for Item D2.2 included:

a. Finalize the charter/mission statement of the planning subunit.

b. Complete the position description for the Maintenance Planner.

c. Establish specific guidelines for the Planner/Analyst.

d. Develop or acquire a formal Maintenance Planner Training Program.

e. Implement Planner Training Program.

This IAP item was determined to be "complete" in August 26, 1990. Since weaknesses still exist in the specific areas mentioned above, the inspectors concluded that the IAP had not been effective for this item. Regardless of the IAP, the internal review begun in December, 1991 (see paragraph 2) appears to have readdressed these issues. The inspector noted that the current Maintenance staff was unaware of the 1987 study.

4. Scheduling

Lack of a sophisticated scheduling mechanism allows inefficiencies to disrupt work flow and inhibits the maintenance staff in performance of corrective maintenance.

Scheduling incompasses the prioritization of maintenance tasks from completion of the planning process to work initiation including integration of other parallel or series dependent tasks.

Large amounts of emergent work disrupt the planned maintenance schedule. Classification of some work as emergent appears to be unjustified and serves to artificially raise the priority. The inspectors considered the lack of control over emergent work to be the most significant scheduling obstacle. The high emergent work volume has caused increased shift staffing and loss of the ability to plan work by supervisors who get displaced from their planners and crews because of being placed on rotating shifts. When separated, the supervisors retain the responsibility to schedule the work in their area. Foremen stated that published schedules quickly become meaningless due to one-by-one replacement of scheduled items with emergent items.

The non-outage work scheduling on site is performed by the Site Work Force Control Group (SWFCG). This group consists of a committee of representatives of the site organizational groups that meets daily for each unit and publishes an integrated site schedule each week. Approximately one year ago a full time Chairman was assigned which resulted in an immediate improvement in SWFCG effectiveness. However, SWFCG has not achieved its full potential due to lack of a dedicated staff in addition to the Chairman and due to the impact of emergent work items

discussed above. Emergent work prevents SWFGC from performing a true scheduling function. Emergent work items transforms SWFGC into a tracking committee that can accomplish little more than force coordination of site organizations. The inspectors considered that many "emergent" items could reasonably be scheduled for the following weeks.

Maintenance foremen interviewed stated that in the past excessive emphasis was placed on minimizing the corrective maintenance backlog. This resulted in "working the easy tickets" at the expense of working more complex, but possibly, more significant items.

Scheduled work is not man-loaded because of the inability to predict the hours required to complete a given task. This is prevented by poor work history and causes inefficient scheduling and, hence, reduced productivity.

Foremen and Supervisors have responsibility to prioritize work, but lack clear guidance on which to base priorities. Recently, Technical Support System Engineers began assisting in this area.

The current priority scheme consists of over twenty possible priority assignments with six possible sub-levels. This system may be too complex to be meaningful and, in practice, priorities above "4" have no meaning to foremen or planning personnel.

The maintenance backlog of open WR/JOs increased from approximately 3100 in early 1989 to approximately 4000 at present. Maintenance backlog was a topic in IAP item D2. The apparent increase may be misleading in that during this time period a lower threshold for problem identification was acquired. The SWFGC Chairman stated, however, that currently, new work items exceed completed work by approximately 40 to 50 items per week.

Technical Support System Engineers were found to be generally knowledgeable of the work backlog on their assigned systems. The WR/JO backlog for the High Pressure Coolant Injection and Service Water (SW) systems was reviewed with the respective system engineers. Their system knowledge and understanding of the backlog was considered to be very good. System engineers have recently begun providing more direct input to Maintenance to establish priorities for backlogged maintenance. The inspectors considered this to be a viable method to assist in managing the backlog. The System Engineers interviewed have established communication with their counterparts at other facilities.

A deficiency was identified on March 18, 1992 concerning approximately thirty backlogged WR/JOs for Service Water. These items involved miscellaneous minor structural support deficiencies identified in early 1990. The system engineer stated that these WR/JOs had been assigned to OM&M (Outage Management and Modification) for disposition in accordance with Brunswick Site Procedure BSP-12, OM&M/Maintenance Interface Procedure, but had not been worked for unknown reasons. OM&M stated that

these items were not properly handled due to miscommunication between Maintenance and OM&M and they had effectively been lost between the two organizations. OM&M began working these WR/JOs after this discrepancy was identified. NED analyzed the miscellaneous deficiencies in the aggregate and determined that no operability concerns had existed. The licensee stated that, had serious structural deficiencies been identified, these would have resulted in LCOs (Limiting Condition for Operation) when the WR/JOs were reviewed by Operations and, therefore, would not have been misplaced. However, the licensee acknowledged that the minor issues were not properly dispositioned and was considering what corrective actions were necessary to prevent similar occurrences.

Maintenance believes that the Operations Clearance Center is under staffed resulting in work delays.

Generic outage schedules do not exist as is the case for many other sites. These would greatly aid planning and scheduling for unexpected, short duration, forced outages.

5. Procedures and Use of Procedures

Maintenance work procedures contain numerous deficiencies which contribute to a general irreverence towards procedural compliance.

The predominant contributing cause of recurring work control events has been related to inadequate procedures or improper use of procedures. Five of the last six escalated enforcement issues are examples of this. QC field assessments conducted since mid January 1992, have identified additional examples of procedure related deficiencies. These deficiencies were predominantly in corrective maintenance procedures (see paragraph 6). Many identified procedure problems do not result in procedures that are not useable, but rather need clarification or enhancement. Based on the QC assessments and interviews with mechanics and technicians, these problems have resulted in the maintenance work force acquiring a sub-standard procedure work ethic. Procedure revision requests are generated but the current revision request backlog represents approximately one year of work for the current staff. When procedure revisions are not soon provided, the work force is conditioned to tolerate the procedure problems. As a result, needed revision requests may never be identified. A notable exception to the general poor quality of maintenance procedures are the Maintenance Surveillance Test (MST) procedures which accomplish Technical Specification required surveillances. The inspectors considered MSTs to be of high quality. This is apparently due to the high frequency use of MSTs and the relatively high consequences i.e. reactor scram, for procedure errors. Therefore, MSTs have received greater attention. This indicates that high quality procedures can be produced when the need is recognized.

One by-product of poor procedures was that too much detail was often provided in WR/JOs which may not receive the level of review and authorization appropriate to formally developed procedures. One

example of this was the WR/JO being followed when the Diesel Generator (DG) No. 1 camshaft was damaged in March 1991 (Enforcement Action EA 91-045). The licensee stated that as a result of that event, the level of detailed instructions allowed in a WR/JO, in addition to any referenced procedure, has been greatly reduced. The inspectors noted, however, that the process procedure containing procedural guidelines, MMM-01, Maintenance: Conduct of Operations, has not been revised and allows the former practice to continue. The inspectors did not identify any recent WR/JOs containing inappropriate detailed instructions that should have been formally proceduralized.

The inspectors reviewed over two hundred WR/JOs to identify problems in the repair instructions, work documentation, and PMTRs. Several areas of weakness were identified during this review and during discussions with personnel:

- The WR/JO is sometimes used as a sequencing document to work around a known inadequate procedure. This is a result of chronic procedure deficiencies and the large procedure revision backlog discussed above.

- The amount of detail provided on WR/JOs varies from planner to planner. This is caused by weaknesses in the planning function and inconsistent demands from foreman to foreman.

- WR/JO work instructions are frequently lined through and new instructions added by hand without re-planning. This is caused by the same reasons discussed above.

- Minimal training is provided for the implementation of the WR/JO process. This is discussed further in paragraph 8.

- PMTRs are not always accurate. This is discussed further in paragraph 9.

Some procedure revision requests are generated because the procedure will not work. The licensee's Nuclear Revision Control System (NRCS) computer data base is provided to indicate revision requests in the backlog for each procedure. The craft is responsible for determining if any backlogged revision is necessary prior to re-using the procedure. This process does not always prevent inappropriate re-use of a procedure in that two percent of all "must have" revision requests are duplicates. The inspectors considered that any re-use of a procedure with known errors is indicative of a weakness in the procedure revision control process.

Exacerbating the poor quality of corrective maintenance procedures is that mechanics and technicians do not clearly understand management's expectations with regard to procedure compliance. Conflicting standards have been unintentionally communicated to the work force. Mechanics and technicians interviewed have heard of verbatim compliance, intent

compliance, and professional compliance with regard to correct procedure use. Management has expended a great deal of effort to communicate expectations, but the desired result has not been obtained.

Another procedure related problem exists with the proliferation of memos throughout the site organizations that serve as procedures or place procedure-like controls on some activities. One example is the 1986 memo that controls painting in the reactor buildings. This activity has the potential to adversely affect the standby gas treatment system. Operation by uncontrolled memos results in the risk that an activity may be conducted by someone either complying with outdated instructions or not complying with pertinent ones.

6. Quality Control Assessment of Work In Progress

The Quality Control organization has begun to provide a valuable tool for determining the extent of work control weaknesses.

The Brunswick Quality Control Unit began field observations of work activities in progress on January 20, 1992. These surveillances involve monitoring throughout an entire maintenance activity instead of only observing QC hold points. This effort was begun to aid in identifying problem areas within the work control process.

The inspectors performed an independent review of approximately 70 QC assessment reports documenting observations for the period of January 20 through March 4, 1992. Almost half of the activities monitored identified problems. Of these, most were deficient in more than one area. The inspectors noted that the deficiencies occurred in four major categories: planning/scheduling, procedural and/or WR/JO inadequacies, procedure compliance, and management oversight. Specific problems in each area included:

- Planning/Scheduling: Most of the deficiencies were in this area (22).
- Actual hours to perform the task exceeded the hours planned.
- Foremen/Supervisors required to add work instructions to WR/JO.
- Repair parts not identified correctly or improper part specified.
- Prints required for the job were not included in the work package.
- Improper component or wire identified in work package.
- Incorrect technical manual specified in work package.
- WR/JO did not specify component location.
- WR/JO specified use of equipment not necessary for job.

These examples indicate a general weakness in the planning/scheduling area which is discussed in paragraphs 3 and 4.

- Procedures and WR/JO inadequacies: This area included 15 identified deficiencies which fell into two major categories. First, the procedure was inadequate and would not work as written, thus requiring a revision. This indicated a lack of procedure validation

prior to initial use and a lack of procedural compliance if the procedure was used previously. The second category was procedures or WR/JOs with unclear, confusing, or missing instructions which required modification by the foremen or planner. The frequency of this deficiency indicates that procedures and WR/JO instructions are not reliable. Further discussion of procedures is contained in paragraph 5.

- Procedure Compliance: There were 11 deficiencies identified in this area. The majority of these were failure to follow the sequence specified in the work document, indicating a procedure or planning weakness. Other examples included: using material not specified in the work package or not using material that was specified; not using procedures referenced on WR/JOs; and no copy of the procedure available when work was to commence. The frequency of the later deficiency suggests that the activities would have continued without a procedure if not for the presence of the QC personnel.

- Management Oversight: There were 14 instances indicating that foremen/supervisors were not present in the field to monitor maintenance in progress. Other discussion in this report concludes that this deficiency is due mainly to the administrative burden placed on foreman and supervisors.

There were only 2 instances cited, out of almost 70 deficiencies, where skill-of-the-craft appeared to be a problem. This is a positive note that indicates that skills training is at least adequate. In addition, the root causes for recent events have not indicated a problem in this area. However, numerous event related problems have been identified in the general category of failure to follow procedure. Further discussion of this is in paragraph 5. Delays and scheduling problems can lead maintenance personnel to rush jobs which leads to short cuts, careless work, and, ultimately, rework. An example of this was the DG-3 outage of October, 1991 discussed further in paragraph 11. The lack of sufficient oversight in the field has allowed these problem areas to continue without correction.

Craft personnel interviewed were generally supportive of the QC presence. They consider this presence will assist in the identification and correction of work control problems. Deficiencies overlooked in the past are now being corrected. The inspectors considered this positive attitude to be a strength.

The inspectors' independent review of the QC field assessments corroborates QC's conclusions. Following approximately one month of field assessments QC considers that: work direction is inadequate in many cases; work scheduling is frequently inadequate; working outside procedures and rework is tolerated; and productivity is suffering a major impact from work instruction and planning/scheduling deficiencies. These observations are consistent with those of the inspectors.

7. Closure Process

The closure process of maintenance activities is cumbersome and not reliable.

Closure refers to that portion of the work control process that verifies that maintenance activities are properly completed. This includes documentation review, post maintenance testing, and return to service.

The closure portion of the Brunswick work control process relies primarily on craft personnel and foremen/supervisors. As directed in MMM-03, Corrective Maintenance (AMMS), numerous actions may be required depending on the type of maintenance conducted. These actions, if all completed, should provide assurance that the maintenance activity is complete. However, the number of work package verifications required of the foremen/supervisors is burdensome and vital verifications may be insufficiently performed at the expense of conducting less important tasks. For example, step 4.5.2.1 of MMM-03 requires, in part, that supervisors ensure that support documentation, i.e., data sheets, sign off steps, etc., are complete. During the DG No. 3 outage of October, 1991, data sheets for cylinder inlet valve timing were missing because the procedure for conducting this activity was not used. Because the procedure was not used, the timing was incorrectly set. The required documentation review did not discover that data sheets required by the procedure were missing. Consequently, the timing error was not revealed until the operability run of the engine failed. This event was a subject of EA 91-158. Similarly, during the recently completed Unit 2 outage, blank data sheets remained following the incompletely conducted main turbine bearing work that ultimately resulted in a forced outage.

Documentation review is a fundamental step in the work control process that, in the examples above, could have prevented these work control events.

Contributing to the DG No. 3 event was the maintenance management burden incurred by not breaking up the work into manageably small steps. The diesel outage centered around performance of MST-DG500, Diesel Generator 18 Month Surveillance, which is a lengthy procedure requiring, in this case, most of the scheduled outage time. This procedure was conducted with a single WR/JO.

The valve timing process was performed midway through the MST by reference to another procedure. Had another WR/JO been initiated to control this "branch" activity, perhaps the closure process for the additional WR/JO would have revealed the missing data sheets. As conducted, the closure process was not invoked until the end of the outage resulting in large volumes of paperwork needing review in a short period of time.

8. Training

The Maintenance organization training function was being reviewed in parallel with implementation of major training facility upgrades. Formal training in work control attributes is insufficient.

Inadequate skill-of-the-craft has not been determined to be a contributing cause for any recent events, however, site management considers this attribute to be in need of improvement. An offsite facility was recently obtained and is being established as a skills and team skills training center. Additionally, a Nordberg diesel engine, similar to those installed as emergency diesel generators is being obtained solely for training purposes. It will be set up in its own facility on site. The Brunswick Training Unit (BTU) has ownership of these initiatives. BTU also conducts all formal training for Maintenance. The inspectors did not assess formal training except for one issue mentioned below.

The Maintenance organization conducts its own Real Time training. Quarterly continuing training is provided by BTU with input of training needs from maintenance .

..e Organizational Analysis in 1989 eliminated the three full time training positions within Maintenance that previously administered Real Time and Quarterly training. The eliminations placed training responsibilities within Maintenance for Real Time training on already overburdened foremen and supervisors, for quarterly continuing training on personnel with no training background, and for specialized training on no one. As a result, the communications between BTU and Maintenance suffered. Maintenance is evaluating re-establishment of dedicated training functions.

One specific training issue was assessed based on an observed performance deficiency. The craft is required to document corrective maintenance performed for a specific maintenance activity on the authorizing WR/JO. This documentation, at times, is not sufficiently detailed. An example of this is discussed in paragraph 9. The inspectors evaluated the training materials associated with training for the WR/JO process given to all Maintenance personnel as part of initial qualification. Instruction is provided for each aspect of the WR/JO process, but no emphasis is placed on why parts of the process are so important. For documentation of corrective maintenance performed, insufficient instruction is provided to emphasize that this documentation becomes the basis for final PMTR determination.

A similar situation exists regarding the importance of re-planning if the work scope changes during maintenance. Scope changes may require, for example, additional LCOs or operational evaluations not readily obvious to the craft, but scope changes do not always result in re-planning and re-authorization. A minor example of this is discussed in paragraph 10b.

Interviews with mechanics and technicians verified that they have not been provided with sufficient training to emphasize these important work control attributes. Mechanics interviewed also stated that, while initial job related training was adequate, insufficient refresher training is provided. One example cited referred to tasks such as lathe machining skills which, if not frequently practiced, are readily lost.

9. Post Maintenance Testing

Post Maintenance Testing has serious programmatic deficiencies that have not been corrected despite the existence of an IAP item, previous regulatory attention, and Corrective Action Program involvement.

An NRC Diagnostic Evaluation Team (DET) conducted an evaluation of the site in April and May of 1989. Their report was issued on August 2, 1989, and raised a concern in the area of PMTR, reference DET 2.1.4(10). This issue was subsequently assigned IAP Item D4, Develop Post Maintenance Testing for ASME Code Repairs.

Item D4 was considered complete by the licensee in December of 1989. However, the item was reopened in May of 1991, due to the limited scope for corrective actions resulting in continuing inadequate post maintenance testing. Examples of this include: NRC Violation 91-02-02, concerning the inadequate PMTR for valves 1-E11-V90 and 1-E11-V89 discussed below; inadequate PMTR for Unit 1 RHR F015B/F017B discussed below; and, RHR SW pump 1B discussed in paragraph 10.

Review of this area indicates programmatic weaknesses still exist. As stated in paragraph 2, the documents governing work controls are cumbersome. This is especially true in the PMTR area. The maintenance planners have prime responsibility for the determination of the appropriate PMTR. In order to assign proper testing requirements, the planner must refer to several different licensee procedures and industry codes. Licensee procedures concerning PMTRs, in whole or in part, include the following:

OMMM-003	Corrective Maintenance (AMMS)
PLP-08	Repair/Replacement Program
ENP-16	Administrative Control of Inservice Inspection Activities
ENP-16.12	Post Maintenance Testing Guidelines for Inservice Inspection Activities
ENP-17	Pump and Valve Inservice Testing (IST)
OSPP-HYD500	Pressure Testing of Pipe and/or Vessels
OSPP-HYD501	ANSI B31.1 Initial Service Test for Welded and Mechanical Joints
AI-79	Administration of AMMS
OI-39	Handling of WR/JOs (Operations)

In addition, all reformatted procedures have a special paragraph (6.2), that has been designated as the only section within the procedure to contain any PMTR recommendations. Clearly, the planner is overwhelmed with PMTR specifications. Additionally, the guidance is often not clear. For example, step 4.2.8.3 of OMMM-003 states:

> Review WR/JO to determine if PMTR testing is required following maintenance completion. The scope of all PMTR is based on the extent of maintenance to be performed and equipment being maintained. PMTR should be performed following most corrective maintenance. The PMTR should contain legitimate requirements that will verify the maintenance activity has been completed satisfactorily or the equipment has been returned to service properly.

Step 4.2.8.4.1 of OMMM-003 states:

> Careful inspection of existing MIs (Maintenance Instructions) is necessary to find possible PMTR recommendations with in the procedure. Particular attention should be given the Precautions and Limitations section of the procedure that may contain PMTR criteria.

Step 4.2.8.4.2 of OMMM-003, which explains special paragraph 6.2 contained in reformatted procedures states:

> This paragraph entitled "Recommended Operability Verification" is not intended to cover every possible condition under which the maintenance is performed, but to convey what should be done when the procedure is performed under routine circumstances. It should not be assumed that paragraph 6.2 contains all testing required to verify equipment operability. The items that are listed are recommendations but should be followed under normal circumstances.

Based on these generalized statements and on discussions with personnel, there is no clear guidance for obtaining accurate PMTRs and the burden is placed on the planner for determination.

In the area of ISI/IST component maintenance, the instructions provided to the planner are weak. For example, step 4.2.9.1 of OMMM-003 states:

> Review the WR/JO to determine if premaintenance ISI testing is required. Containment isolation valves may require local leak rate testing (LLRT). This requirement is dependent upon the type repair to be performed. Refer to ENP-17 and PLP-08 in making this determination.

Step 4.2.9.4 of OMMM-003 states:

> Review the WR/JO to determine if post maintenance ISI testing is required. This requirement is dependent upon the type of repair to be performed. Refer to ENP-16, ENP-16.12, ENP-17 and/or PLP-08 in

making this determination. If post maintenance testing within ISI boundary is required, indicate the requirement or requirements in section B of the PMTR.

Again, the burden is placed on the planner - including critical ISI/IST requirements. Currently, formal ISI/IST reviews by Technical Support ISI personnel occur only after Operations has closed the WR/JO. If requested by the planner, the Technical Support ISI representative may be contacted for assistance in determining PMTRs for ISI/IST components. However, review of WR/JOs and interviews indicate this is not the normal process.

Exacerbating this, the computer Engineering Data Base System (EDBS) is inaccurate in the identification of ISI/IST components. For example, when the identifying tag number for a specific ISI valve is entered into EDBS, it will be identified as an ISI/IST component. However, when the actuator for the same valve is entered, it is not identified as ISI/IST. This can result in systems/components being returned to service with incomplete PMTRs.

Licensee management has known that planner training and guidance for PMTRs is weak. IAP items D4 and D2.2 address this, in part, but have not been successful in correcting this problem (additional discussion of this is included in paragraph 3). With regard to ISI/IST requirements, improved training and procedures may increase the planners' ability to properly assess post maintenance testing. But, subtleties in the ASME Code may make this an unreasonable expectation.

Fortunately, the majority of PMTRs reviewed were excessive and, therefore, conservative. This is caused by the planners' acknowledged training deficiency which compels them to overdesignate - listing every possible PMTR for a specific component regardless of the maintenance performed. This default approach is encouraged by the planners' tendency to rely on the STAs or other Operations personnel as a "backstop" for assurance that the correct PMTRs are listed.

Perhaps the most significant PMTR weakness is that no one group is responsible for PMTRs. Determination, performance, and review of testing requirements can involve Maintenance, Operations, Technical Support or any combination of these three groups with none of the three held accountable.

As previously stated, the licensee recognizes the deficiencies in the PMTR process. A task force studied this issue in July 1991 and identified several issues that correspond to those identified by the inspectors. However, the weaknesses still exist due to minimal or no corrective action being taken. The issues identified include:

Planners assigning the PMTRs do not have access to experienced support personnel on a 24 hour basis for discussions of questions on assignments. The current training program does not prepare them to make independent judgements on every case. This problem is

compounded on night shift and weekend coverage when staffed by planners who do not daily assign code related PMTRs, and have less work experience in this area.

Evaluation of the "applicable" requirements for the affected components/equipment requires extensive research into site specifications, codes, (and interpretation, code cases, relief request, etc.), vendor recommendations, and license commitments to be correctly identified and assigned. These references are not readily accessible, and the individual requirements are scattered throughout the documents making finding the applicable requirements very difficult. Site evaluations and interpretations for compliance to applicable requirements form a basis for assignment of PMTRs. These are not collected or easily retrievable so that consistent guidance can be applied to subsequent PMTR assignments.

Maintenance and Operations sometimes disagree on the PMTR requirements listed on the WR/JO. As a result, following maintenance work completion, Operations may revise the PMTRs which results in the elimination of testing requirements. However, little or no feedback is given to the planners for the improvement of the PMTR specification. A risk is taken that at times a required PMTR will be missed or eliminated which may create a plant problem. STAs have received no formal training on the PMTR process. Because of the above concerns, it is unclear who is accountable for the PMTR specification. Maintenance, Technical Support-ISI, and Operations are all presently selecting and deleting PMTRs.

The planners are having difficulty with ENPs and other site procedures which may contain references for selection of PMTRs. This is compounded by the use of partial procedures. In some cases partial procedures are used for performance of work. In these cases procedural specified PMTRs have to be reviewed to determine where specific PMTR is/is not warranted by the work performed. Existing procedure formats contribute to the difficulty in making proper PMTR selection.

Planner responsibility has changed considerably in the recent past. The enhanced planning requirements governing Q-list WR/JOs, increased difficulty in obtaining parts for WR/JOs combined with increased management reliance on planners to include safety, fire loading, and cleanliness concerns during the planning process have consumed the available time to research and assign PMTRs.

Maintenance foremen have, on occasion, changed the scope of WR/JOs without considering the impact of the change on the PMTR requirements.

The last observation is discussed further in paragraphs 8 and 10.

The inspectors considered these issues to be pertinent to the PMTR task force purpose. But, since these issues were identified in July 1991, no corrective actions have been apparent.

Two previous events involving post maintenance testing were reviewed to assess the licensee's corrective actions:

Inspection Report 325,324/91-02 documented the occurrence of vent and drain valves being replaced in safety related systems without stem packing installed in the new valves. This was discovered when a technician's clothing was wetted and contaminated by stem leakage on January 22, 1991, when one of the valves was opened. A Notice of Violation was issued in this regard on March 12, 1991. The violation addressed, in part, that post maintenance testing requirements for the valves' installation was inadequately prescribed and, therefore, inadequately performed. The inspection report stated that serious post maintenance testing programmatic weaknesses were revealed. In the Reply to Notice of Violation dated April 11, 1991, the licensee stated that "Improved guidance with respect to determination and conduct of Post Maintenance Testing Requirements will be developed by August 19, 1991."

Internally, this issue was formally assigned to Maintenance via FACTS (Facility Automated Commitment Tracking System) 91-B0524. In a response to Regulatory Compliance dated August 20, 1991, the Maintenance resolution was issuance of procedure OSPP-HYD501, American National Standards Institute (ANSI) B31.1 Initial Service Test for Welded and Mechanical Joints. While this served to address the event specific issue of PMTRs for ANSI B31.1 compliance, it did not address the larger programmatic PMTR problems identified in the Inspection Report. Accordingly, Regulatory Compliance rejected this response, although this was not formally done. No recognition occurred at that time that the commitment date made in the violation response had expired. The subsequent reply from Maintenance dated December 22, 1991 requested an extension to March 1, 1992. The extension request was based on management changes within Maintenance. The request was granted with recognition that the commitment date had been missed. The extension was signed by the Manager-Regulatory Compliance and the Plant General Manager on January 6 and 7, 1992, respectively. No communication with the NRC occurred as a result of the missed commitment. On March 12, 1992, the inspectors discovered the missed commitment. Additionally, the March 1, 1992 extension granted to Maintenance had expired without action. No action had yet been finalized with regard to the programmatic weaknesses cited by the NRC one year before.

The licensee's response dated April 11, 1991 to the Notice of Violation dated March 12, 1991 stated that corrective actions would be developed by August 19,1991. These actions had not been developed by March 12, 1992 and thus constitutes a deviation from committment made to the NRC. Deviation 325,324/92-04-01, Failure to meet committment with regard to Violation 325, 324/92-02-02.

On July 5, 1991, during the time that corrective actions were supposedly being formulated based on the event described above, the unit 1 B train Low Pressure Coolant Injection (LPCI) outboard injection valve, E11-F015B, failed to open during surveillance periodic test (PT) 8.2.2B, LPCI/RHR Operability Test. This was caused by an incorrectly terminated lead in the actuator of the inboard injection valve, E11-F017B. This lead is in the interlock circuit between the two valves that prevents both valves from being opened when reactor pressure is greater than 410 psig - thereby protecting the low pressure portion of the RHR system from the elevated pressure of the reactor. This type interlock is known as an intersystem LOCA interlock. The affected lead had been connected to a spare terminal, thus providing an open circuit, which prevented the F015 valve from opening because the interlock logic falsely indicated that the F017 valve was open. Following reconnection the PT was successfully performed. ACR 91-305 was initiated as a result of this event.

Review of maintenance records indicated that the lead was lifted and reterminated incorrectly on November 17, 1990, during the previous unit 1 refueling outage. The post maintenance test for this maintenance was performed on February 1, 1991 and consisted of the same PT that was being performed on July 5. However, the valve opened in February with the incorrectly terminated lead because the reactor was shutdown and less than 410 psig.

Maintenance determined that the incorrect re-termination occurred during work for WR/JO 87-BFKQ6. This WR/JO gave instructions to correct miscellaneous wiring deficiencies in accordance with procedure USPP-CBL001, Termination of Electrical Cables. The description of "corrective action" performed annotated on the WR/JO stated "cut incorrect terminations back, restripped wire and reterminated" per the procedure. Attachment 1 to the procedure listed the wire and terminal numbers and included the independent verification signoffs for all wire lifts and terminations. Sixteen leads were lifted and reterminated. This attachment was not included in the work package made available to Operations at the completion of the work. The independent verifier in this case was a mechanical contractor peer reviewer.

The significance of this event was low with regard to the safety function of the valve. In a LOCA situation, the valve does not get a open signal until reactor pressure decreases below 410 psig. The miswiring only prevented testing of the valve with elevated reactor pressure. However, this event raised specific work control issues. These included:

- The description of work was too general to determine appropriate PMTR.
- Required procedure documentation was not included in the work package.
- Use of alternate craft contract workers as peer reviewers for independent verification.
- No program exists for post maintenance testing of valve interlocks.
- No program exists for periodic testing of valve interlocks.

The inspector discussed these issues with Maintenance following the event. However, none of these issues were raised in the Maintenance initiated ACR that was closed on August 8, 1991. Corrective actions identified in the ACR consisted of completed actions from previous work control events such as "Please Listen" training. Maintenance was assigned exclusive responsibility on the ACR despite the programmatic issues that crossed organizational boundaries with Operations and Technical Support.

The NRC considers that in these two cases the licensee has had ample opportunity to address the programmatic weaknesses related to post maintenance testing. The first case illustrates that corrective actions, even when associated with a Notice of Violation and an IAP item, were not receiving appropriate management attention. The second case being identified in the time period when corrective actions were being considered for the first case should have served to emphasize the scope of the programmatic weaknesses. The ACR in that case did not illicit appropriate corrective actions with regard to post maintenance testing and other work control aspects. The ACR process was either insufficient or insufficiently applied to expand event specific corrective actions to address programmatic concerns.

10. Other Process Deficiencies

In addition to process deficiencies directly related to the work control mechanism, deficiencies exist in support-type processes such as clearances. Two examples in the form of case histories are discussed below.

a. CAC 1261 Monitor Event

At 3:00 p.m. on February 25, 1992, the licensee discovered that the Unit 2 primary containment was open to the reactor building via the containment
atmosphere monitoring system. Unit 2 was operating at the time. This condition occurred during replacement of the failed vacuum pump for the Unit 2 containment radiation monitor 2-CAC-AT-1261. This is a small vacuum pump located in the reactor building that takes a suction on the drywell atmosphere and passes it through radiation monitors and returns the sample volume back to the drywell. This event occurred because a clearance was cancelled prior to reconnecting the suction and discharge piping due to the following circumstances:

Work Request WR/JO 92-ACXZ1 was generated on February 3, 1992, identifying a noisy vacuum pump. The work request was submitted for route scheduling, since the pump was still operable, and clearance 2-92-0052 was developed by the clearance center on February 7, 1992. On February 21, 1992, the procedure that replaces the vacuum pump, OCM-PV500, CAC Radiation Monitor Vacuum Pump, was revised to include a vendor recommendation to run-in the new pump under a no-load condition. The revision allowed cancelling the clearance with the pump tubing disconnected to allow for the break-in run. On February 25, 1992, the work package was reviewed and approved by the

shift supervisor and clearance 2-92-0052 was hung to support pump replacement. The clearance involved electrical isolation of the pump motor and mechanical isolation from the drywell by closing six solenoid operated containment isolation valves in the pump suction and discharge paths and danger tagging their respective switches. At 11:30 a.m., the pump was replaced with the suction and discharge tubing not fully reconnected. The clearance cancellation was requested by maintenance department personnel as directed by step 7.4.9 in procedure OCM-PV500. Because maintenance indicated the work had been completed "Sat" (satisfactory) on the clearance cancellation request, operations cancelled the clearance and reopened the containment isolation valves at 12:30 p.m. to allow maintenance to perform the break-in runs. At 3:00 p.m., the three break-in runs were completed and maintenance requested operations to secure the pump to allow reconnection of the tubing. At that time, the SRO recognized that the drywell had been opened to the reactor building through the disconnected tubing. The containment isolation valves were then reclosed and controlled under clearance 2-92-281. The tubing was subsequently reconnected and the pump returned to service.

While direct communication between the primary and secondary containment is prohibited by Technical Specifications, there was no immediate safety significance of this event in that the Primary Containment Isolation System Group 6 isolation function remained operable during this time. Recognizing the potential programmatic deficiency, the licensee initiated a SIIT team (Site Incident Investigation) to identify the root causes and corrective actions.

The inspectors consider the areas of weakness that caused this event to include the following:

- The clearance center typically does not perform an in depth review of the maintenance procedure for which they are providing isolation. Normally, the isolation is for the specific component/system to be worked. Therefore, instructions to cancel a clearance contained in a procedural step may not be identified by the clearance center. Although, in this case, the initial clearance generated on February 7 would have been adequate for the work to be performed, as described in procedure OCM-PV500, Revision 1, which was submitted at that time. Revision 1 did not require performance of the break-in run under no load conditions. Therefore, the tubing was reconnected prior to cancelling the clearance. The procedure was modified on February 21, to allow running the pump with the tubing disconnected, which was two weeks after the clearance was requested. However, if the new procedure had been submitted with the clearance request, the event would have still occurred due to the lack of procedure review by the clearance center.

- Maintenance department modified a procedure, which changed the scope, after the initial procedure had been submitted to the clearance center without notifying the clearance center or

obtaining operations department review of the procedure. Had either of these occurred, the improper sequencing of cancelling the clearance may have been detected.

- The procedure revision was in error. Step 7.4.9 should have stated to request a clearance boundary change to cancel the clearance on the pump motor only and leave the mechanical isolation in effect until the tubing was reconnected.

- Maintenance department personnel were in error when they requested cancellation of the clearance prior to all work being complete. The equipment clearance procedure, AI-58, step 3.13.6, states:

> Prior to signing off a clearance for cancellation, the clearance holder's responsibility is to verify that all work items they are responsible for are complete and the clearance supplement sheet has been updated. In addition, the clearance holder should inform the Clearance Center staff of the equipment "as left condition" and any precautions or prerequisites that should be observed prior to returning the equipment to operable status.

In addition, maintenance personnel requesting cancellation circled "Sat" in section 5.0 of the Equipment Clearance Form. Section 5.0 of this form, Cancellation Requested, states the equipment is ready to be operated or remark made as to why not. Step 5.4.2.5.C of the procedure states:

> The clearance holder requesting cancellation shall indicate if the work accomplished is completed and the equipment is ready for operation or post maintenance testing to the best of his knowledge (with the exception of the valve and electrical lineup) by crossing out the letter "U" and/or circling the letter "S" in the Sat/Unsat column of Section 5.0 and on the Clearance Supplement Sheet. If the work is unsatisfactory, a NOTE explaining why the work item is unsatisfactory is required to be made by the clearance holder on the Clearance Supplement Sheet and on the Clearance Form.

- Operations personnel were in error when they cancelled the clearance and repositioned the isolation valves. Step 5.4.2.7.D states:

> If a system boundary has been breached, system integrity verification should be completed by direct communication with the responsible work group or visual inspection prior to filling the system or repositioning isolation valves.

- Operations personnel cancelled the clearance based upon a procedure which they did not review and based upon a request from Maintenance personnel who cannot reasonably be expected to understand the impact on primary containment.

As an interim measure, licensee management issued a memorandum concerning this issue and the clearance cancellation process in general. The memorandum was addressed to all site personnel involved in the clearance process and emphasized clearance policies.

The inspectors considered the root cause analysis by the SIIT team to be thorough. Similar to other work control process procedures (discussed in paragraph 2) AI-58 has accumulated event specific process repairs to paralyze the process. Inadequate root cause analysis of past events allowed the event specific process repairs to paralyze the process. The result is a cumbersome procedure too complicated to be effective. An example is the "breached system" requirement mentioned above. The inspectors considered that control room personnel could not reasonably be expected to remember such an obscure requirement. Even if they had, it is unlikely that this event would have been prevented since the connections would have appeared to be properly connected. This requirement was based on a similar event several years ago when a system was not fully reassembled resulting in a significant spill. As a further example of the event specific nature of this requirement, there is no parallel for clearances on electrical systems. Because the work control root cause analysis for the prior event focused on the clearance process instead of the work control error, repetition of the event, in a slightly different scenario, was inevitable. The inspectors concluded that the maintenance procedure inappropriately attempted to direct the clearance process and would likely have been successful had the clearance not been addressed whatsoever.

b. RHR Service Water Booster Pump Event

In January 1992 preventive maintenance was begun on RHR SW booster pump 1B. Each unit's RHR SW system contains two SW booster pumps in each train that are normally in a standby configuration when the unit is at power. To work on either pump in a train requires a clearance to shut common isolation valves that also disables the other pump in that train - placing the unit in a 7 day LCO. The nature of the work on the 1B pump progressed to a need to physically remove it from the system. This activity was projected to exceed the 7 day allowed outage time. Thus, a decision was made to blank off the connections following pump removal to allow lifting the clearance and opening of the isolation valves. In this manner the second pump could be returned to standby status and the LCO shifted to 31 days as allowed by Technical Specifications.

When this activity was being prepared consideration was given to the removal of a seismic anchor point - the pump casing itself - and corresponding temporary accommodations such as pinning of a spring can. This was documented thoroughly in Engineering Evaluation Report

(EER) 92-0004, dated January 5, 1992. Not considered, however, was the temporary change in the system fluid boundary, i.e. replacement of the pump with blank flanges. Properly engineered flanges, gaskets, and fasteners were selected to blank off the pump connections, but no consideration was given to any code required or otherwise prudent post maintenance testing as a result of the temporary flanges and mechanical joints becoming a part of the system fluid boundary.

After the flanges were installed and the 7 day LCO exited, but prior to the end of the 7 day period, the inspector inquired as to what testing had been conducted to verify the leak tightness of the temporary modification and results of the safety evaluation as required by 10 CFR 50.59. At that time, the licensee considered that neither was required since this was only a maintenance activity. The licensee stated that any required testing would be conducted following reinstallation of the pump. The NRC considers that since a new pressure boundary was established and this was the basis to exit the 7 day LCO, that a temporary modification existed that changed the system from its original configuration. Ultimately, a pressure boundary test was conducted within the original 7 day LCO period with satisfactory results. The inspector's concern was not the technical aspects of this particular case, but rather the programmatic aspects that allowed the maintenance activity to include an unrecognized temporary modification. ACR 92-016 was initiated on January 9, 1992. The ACR appropriately stated that "this event has wide implications involving WR/JOs creating temporary conditions which needs careful review."

Inasmuch as this system is classified as ASME Code Class 3, the NRC considers that a Code violation occurred in that testing in accordance with IWA 5000 of ASME Boiler and Pressure Vessel Code, Section XI, was not conducted prior to returning the temporarily modified system to unrestricted service. This violation is diminished in that, when tested subsequent to the inspector's question, satisfactory results were obtained. This violation is combined with a further violation stated below.

ENP-12, Engineering Evaluation Procedure, establishes the guidelines for Temporary Conditions. These guidelines were insufficient to capture the entire temporary modification nature of the SW booster pump maintenance. ENP-12 was successfully invoked for the temporary seismic qualification consideration, but this process did not adequately address the system fluid boundary portion of the temporary condition nor result in the required 10 CFR 50.59 safety evaluation.

The inspectors noted that there is not a condition referred to on site as a "temporary modification." These situations are known as "temporary conditions." Controls for temporary conditions are scattered in several procedures and cross organizational boundaries: Administrative Instruction, AI-59, Jumpering and Wire Removal, a site-wide procedure, covers temporary conditions involving electrical circuits; Operating Guideline, OG-8, Guidelines for Preparation of

Temporary Mechanical Jumpers, an Operations procedure, covers temporary mechanical (fluid) jumpers, and ENP-12, a Technical Support procedure, the controlling document for this case, which accommodates other functions as well. In contrast, the two other CP&L nuclear sites have a process procedure specific to "Temporary Modifications." These are MOD-016, Temporary Modifications, and MOD-206, Temporary Modifications, for the Robinson and Harris sites, respectively. After reviewing these procedures, the inspectors concluded that a similar scenario would not have occurred at Robinson or Harris if these procedures were properly invoked.

Another existing mechanism was available to prevent this event. The booster pump was removed, flanges installed, flanges removed, and the pump reinstalled - all on a single WR/JO. This approach prevented the closure of the work control process from occurring until the pump was reinstalled. The closure process demands that PMTR be considered, and thus, may have identified the need had this process been invoked following completion of the temporary configuration. Had two WR/JOs been planned - one to remove the pump and install the flanges and the second to remove the flanges and reinstall the pump - the planner would have also had to consider PMTR. Another weakness revealed was that the Technical Support ISI/IST personnel were not consulted for any Code considerations. This is an example of the weakness of ISI/IST involvement in the PMTR process discussed in paragraph 9.

The NRC considers that the temporary change to the RHR SW system constituted a change in the facility as described in the safety analysis report. 10 CFR 50.59 requires that in these cases a written safety evaluation be performed which provides the basis for the determination that the change does not involve an unreviewed safety question. A written safety evaluation was not conducted for the change described above thus constitutes a violation of 10 CFR 50.59. Violation 325-92-04-02; Failure to perform 10 CFR 50.59 safety evaluation and ASME code required testing.

Another example of a work control deficiency was also identified during this event. Upon reinstallation of the pump, a problem with a mounting bolt was discovered which necessitated repair of the pump foundation. This repair, which constitutes a job scope change, was accomplished without further planning or authorization. Refer to paragraphs 8 and 9 for additional discussion of this process deficiency. This error was identified by QC which is a positive indication that QC is providing valuable input to the site.

11. Review of Prior Events

The inspectors reviewed root cause analyses and corrective actions addressed in responses to violations for two work control events cited in previous NRC inspection reports.

The first event reviewed was the feed water computer point calibration of January 25, 1991. This event was discussed in Inspection Report 325,324/91-01 and was the subject of Enforcement Action EA91-023. The root cause of the event was failure to follow procedure in that the procedure performing the calibration had as its only prerequisite step a requirement for the unit to be in cold shutdown or refueling. In spite of this requirement, which was overlooked by numerous personnel, the calibration was attempted with the unit at full power resulting in a reactor scram.

The second event involved the DG-3 valve timing issue of October 1991. This event is also referred to in paragraph 7. This event was discussed in Inspection Report 325,324/91-26 and was a subject of Enforcement Action EA 91-158. Again, the root cause was procedural non-compliance in that a mechanic chose not to use the procedure for setting the engine's inlet valves resulting in faulty and potentially damaging engine operation and a forced unit outage.

The inspectors generally agreed with the root cause determinations, however, for the DG-3 event additional root cause analysis may have been appropriate. The inspectors considered the work environment established for the DG-3 extended outage contributed to the mechanic's decision not to use the procedure. This conclusion is shared by members of the plant staff. Specifically, an exclusion area was established consisting of the entire DG-3 cell. This prohibited casual access by personnel not directly involved with the maintenance activities. This exclusion area and the knowledge that no QC hold points were required and no full time or random QC surveillances would occur provided the environment conducive to bypassing of a procedure by a mechanic not wanting to be burdened by paperwork. In the response to EA91-158 dated February 14,1992, the licensee acknowledged the value of supervisory presence and quality control oversight.

Corrective actions for the first event were considered inadequate as evidenced by occurrence of the second event.

12. Conclusions

The inspectors concluded that fundamental concepts of work control are not well understood by plant personnel. Examples include:

- Lack of understanding of critical WR/JO functions including work documentation and scope changes (paragraphs 8 and 10)
- Lack of understanding of temporary modification processes (paragraph 10)
- Lack of understanding of basic post maintenance testing concepts (paragraphs 9 and 10)
- Lack of understanding of prudent post work reviews (paragraphs 7 and 11)

Some maintenance personnel considered a WR/JO to be primarily the vehicle for communicating a problem and to charge time for fixing the problem - as implied by its title: work request/job order. Not thoroughly understood was the concept that a WR/JO is an authorization to conduct maintenance as well.

The inspectors considered that the lack of fundamentals may be due in part to isolation of the plant within the utility and the industry. Until recently, Maintenance personnel have not visited other sites to gain differing perspectives. Three other sites were visited recently, but one of these was Harris. The inspectors considered disturbing that conduct of maintenance activities at another CP&L site was not already known. This suggests that little or no Corporate involvement exists to provide consistency between the sites. An example of inconsistency is described in paragraph 10. Inconsistency fosters isolation and hinders experience sharing. This topic is the subject of IAP item D16, which the inspectors did not pursue. Between the site organizations as well, compartmentalization exists that allows some duplication of functions. For example, three procedures exist for administering WR/JOs; one for Maintenance, one for Operations, and one for everyone else. The inspectors concluded that improvements in the work control program could be gained by further information exchange between the CP&L sites.

Root cause analyses or resulting corrective actions for work control events and/or programmatic deficiencies have been insufficient in the past. Examples of this are discussed throughout this report. As a result, processes have become inefficient and events have recurred. Further modification of the existing programs will only sustain the existing weaknesses. The systemic nature of the problems requires significant overhaul of the processes.

13. Exit Interview (30703)

The inspection scope and findings were summarized on March 27, 1992, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection findings in the summary. The findings listed below were summarized on April 24, 1992. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report.

DEVIATION 325,324/92-04-01	Failure to meet commitment with regard to Violation 325,324/92-02-02.
VIOLATION 325/02-04-02	Failure to perform 10 CFR 50.59 safety evaluation and ASME code required testing.

14. Acronyms and Initialisms

ACR	Abnormal Condition Report
AI	Administrative Instruction
AMMS	Automated Maintenance Management System
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BTU	Brunswick Training Unit
CAC	Containment Atmospheric Control
CFR	Code of Federal Regulations
CM	Corrective Maintenance
CP&L	Carolina Power and Light
DET	Diagnostic Evaluation Team
DG	Diesel Generator
EA	Enforcement Action
EDBS	Engineering Data Base System
ENP	Engineering Procedure
EQ	Environmental Qualification
EER	Engineering Evaluation Report
FACTS	Facility Automated Commitment Tracking System
I&C	Instrumentation and Control
ISI	In Service Inspection
IST	In Service Test
LCO	Limiting Condition For Operation
LLRT	Local Leak Rate Testing
LOCA	Loss of Coolant Accident
LPCI	Low Pressure Coolant Injection
MI	Maintenance Instruction
MMM	Maintenance Management Manual
MST	Maintenance Surveillance Test
NED	Nuclear Engineering Department
NRC	Nuclear Regulatory Commission
NRCS	Nuclear Revision Control System
OG	Operating Guidelines
OI	Operating Instruction
OM&M	Outage Management & Modification
PLP	Plant Procedure
PM	Preventive Maintenance
PMTR	Post Maintenance Testing Requirements
PT	Periodic Test
Q	Quality, Qualified
QC	Quality Control
RHR	Residual Heat Removal
SIIT	Site Incident Investigation Team
SPP	Special Procedure
SRO	Senior Reactor Operator
STA	Shift Technical Advisor
STSS	Surveillance Test Scheduling System
SW	Service Water
SWFCG	Site Work Force Control Group
TS	Technical Specification
WR/JO	Work Request/Job Order