UNITED STATES
NUCLEAR REGULATORY COMMISSION
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PDR per Jean Rathje

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FROM: Edward L. Jordan, Director
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of Operational Data

SUBJECT: STATUS REPORT ON THE DIAGNOSTIC EVALUATION PROGRAM

The subject report will be provided to the Commission in the near future. However, prior to sending the report to the Commission, I am providing it to you for information and would appreciate receiving any comments you may have by February 16, 1990.

Edward L. Jordan, Director
Office for Analysis and Evaluation
of Operational Data

Enclosure:
Status Report on
Diagnostic Evaluation

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STATUS REPORT ON THE DIAGNOSTIC EVALUATION PROGRAM

Introduction

Following meeting No. 128 of the Senior Contract Review Board (SCRB) on July 19, 1988, the SCRB recommended that the Chairman approve entering into a 3-year competitive contract for contractor support for the Diagnostic Evaluation Program. The Chairman subsequently approved the request on December 5, 1988. The SCRB also requested that AEOD report back within one year on the status of the Diagnostic Evaluation Program (DEP). This paper provides the requested status report on the program.

Background

With the assignment of dedicated staff resources within AEOD for the DEP, following the March 1987 NRC reorganization, detailed program development and implementation were initiated. Initial actions by the staff of the Diagnostic Evaluation and Incident Investigation Branch (DEIIB) were directed at preparing a manual chapter on the program. On June 18, 1987 a proposed manual chapter was distributed for comment and on March 3, 1988 a final Manual Chapter was approved for use. The approved Manual Chapter 0520, "NRC Diagnostic Evaluation Program" documents the scope, objectives, and basic requirements of the DEP. As stated in the manual chapter, the overall goal of the DEP is to promote public health and safety by independently assessing licensee performance at selected reactor facilities. Specific objectives of the DEP are to: (1) provide additional information to supplement SALP, Performance Indicator (PI) and other assessment data, to enable NRC senior management to make a more informed decision concerning overall plant performance; and (2) evaluate in a performance and safety-oriented framework, the actions and involvement of licensee management and staff in safe plant operations.

Discussion

In the period since the DEP was formally authorized and staffed, a total of seven Diagnostic Evaluations (DEs) and one Special Evaluation have been conducted by AEOD. The plants and licensees involved in these evaluations are listed in Table 1.

TABLE 1. COMPLETED DIAGNOSTIC EVALUATIONS

Plant	Licensee	Management Contractor Personnel	Engineering Contractor Personnel	Report Date
Dresden	CECo	0	0	November 1987
McGuire	DPC	2	3	March 1988
Turkey Point*	FP&L	0	0	June 1988

Enclosure

TABLE 1. COMPLETED DIAGNOSTIC EVALUATIONS (CONTINUED)

Plant	Licensee	Management Contractor Personnel	Engineering Contractor Personnel	Report Date
Fermi	DECo	3	0	November 1988
Perry	CEI	2	1	May 1989
Brunswick	CP&L	2	2	July 1989
Arkansas	AP&L	2	2	December 1989
Palo Verde	APS	2	1	February 1990**

* Special Evaluation
** Projected Date

The plants involved in these evaluations have comprised: each of the domestic Nuclear Steam Supply System vendors; a broad range of plant operational experience in terms of the number of operating cycles and performance history; and large and small nuclear utilities and; four of the five NRC regions.

To develop consistency in the process and procedures used by a Diagnostic Evaluation Team (DET), written guidelines were developed in preliminary (trial use) form and later finalized based on lessons learned from completed Diagnostic Evaluations (DEs). The final DET guidelines were issued in June 1989. With time and experience, comprehensive detailed evaluation plans were also developed for each of the functional areas assessed by DETs. These functional areas include operations, training, maintenance, surveillance/testing, engineering support, quality programs and management and organization. These work plans have significantly contributed to efficient planning and thorough onsite evaluations, and overall success of each evaluation.

Success of DETs is highly dependent on the capability and expertise of its members and the quality of team management. Despite the competition within the agency for the best available resources, NRR and Regional support for diagnostic teams has been very good. Consequently each team has been of a very high caliber. In addition, NRR personnel have served as either the team manager or deputy team manager for three of the DEs while AEOD has provided the team manager or deputy team manager for all of the DEs which have been conducted.

DETs have identified a number of important safety issues and significant programmatic weaknesses at the plants evaluated. Strengths and improvement initiatives have also been found at the plants visited. Table 2 lists several of the significant performance weaknesses and strengths (or improvements) found by DETs.

TABLE 2. PERFORMANCE WEAKNESSES, STRENGTHS, AND IMPROVEMENTS

Weaknesses identified by DETs:

- Strained Resources
- Organizational Instability
- Communications Problems
- Ineffective Engineering Support
- Limited QA Staff Capabilities
- Unreliable Equipment
- Inadequate Check Valve Testing
- Inadequate MOV Maintenance
- Operator Overtime Safety Issue
- IST Program Deficiencies
- Poor Equipment Failure Trending
- Weak Operations Experience
- Audits/Surveillances Programmatic vs. Technical
- Fragmented Problem Identification Programs
- Problem Identification Threshold Too High
- Weak Root Cause/Corrective Action Programs
- Inadequate Corporate Monitoring

Strengths/improvements identified by DETs:

- Corporate Leadership, Oversight and Involvement
- Integrated Performance Plans
- Staff Technical Capabilities
- Management and Staff Attitude Toward Safety
- Managerial and Organization Changes
- Programs for Improved Engineering Support
- Performance Monitoring/Self-Assessment
- Operations Experience Across Station Organization
- Use of Technical Experts on Audit Teams
- Unscheduled, Performance-Based Surveillances
- QA Staff Training and Rotational Assignments
- Proactive Offsite and Onsite Safety Review Committees
- Comprehensive Condition Report and Audit/Surveillance Finding Trending

The most prevalent programmatic weaknesses in the safety-related equipment area appear to involve motor-operated valves and check valve programs. The root cause analysis programs at most plants were also found to be weak. Many of the plants had significant backlogs of known problems which were awaiting engineering evaluation or corrective maintenance. The strain on resources which these backlogs imposed, coupled with a frequently insufficient design basis documentation, ineffective engineering support and the absence of effective teamwork among station support departments, were often the major impediments to performance improvement.

Except for Dresden, McGuire, and Perry, each of the plants were, at the time of the evaluation, found to be in a period of organizational transition. Management changes and organizational restructuring were underway in response to earlier performance assessments. These organizational changes indicated that licensee senior executives responsible for these plants had already

recognized the need for improved organizational effectiveness to achieve the higher performance standards. Frequently the higher standards were being driven by competitive and economic realities as much or more than rising safety or regulatory pressure.

DETs have frequently found safety issues of plant-specific and generic nature requiring further followup actions by the NRC staff. These issues have been documented in an EDO staff actions memoranda for action by the responsible office. Potentially generic issues have included: inservice testing (IST) programs which had not been approved by the NRC staff; check valve IST program deficiencies; inadequate minimum flow in centrifugal pumps and; plant equipment degradation inside containment due to steam leaks within Technical Specification Limits. Attachment 3 presents a perspective (from ANO) on the type of plant-specific deficiencies identified by a DET.

The DEP has also matured in its ability to assess the involvement and effectiveness of licensee management in ensuring safe plant operations. Comprehensive plans and methods for management and organizational evaluations have been developed and improved based upon the experience and insights gained from the preceding evaluations. This experience has allowed DETs to gauge observed management effectiveness and practices in ensuring safe plant operations in terms of the standards at a number of operating nuclear power plant facilities.

Management and organizational contractor personnel have also been effectively integrated to support development and implementation of the DEP. As shown in Table 1, beginning with the McGuire evaluation, two management contractor personnel typically have been used for each diagnostic evaluation. It has been AEOD's philosophy to continue to expand the number of contractor personnel with diagnostic evaluation experience in order to increase the flexibility and experience base in this important support area. Thus to date, a total of five different contractor personnel have participated in DETs.

The quality of the management and organizational evaluations have received recognition from both NRC senior management and industry executives. A measure of the scope, depth and impact achieved in this area is reflected by Attachment 1 which contains illustrative examples of DET identified management and organizational weaknesses. This attachment also shows that licensees have responded to management and organizational findings with a high degree of responsiveness and importance.

DETs have found inadequate engineering and technical support to be an important underlying cause of performance problems of many of the plants evaluated. In the engineering support area, contractor personnel have been effectively utilized to review safety-related equipment design, engineering programs and engineering organizational effectiveness. Attachment 2 provides illustrative engineering support weaknesses identified by DETs and the licensee responses to these findings. The attachment shows that findings in this area have been significant and well-received by licensees.

An important objective of each DET is to determine the probable root causes for licensee performance problems. DETs have succeeded in identifying probable root causes due to: the broad evaluation scope; extensive use of document reviews and interviews; comprehensive management and organizational reviews;

and, effective team communications and experienced team management. A listing of some of the root causes identified by DETs is provided in Table 3.

TABLE 3. ROOT CAUSES FOR PERFORMANCE PROBLEMS

- Plant Neglected in Favor of Other Priorities
- Fossil Plant Attitude
- Lack of Clear Performance Goals
- Ineffective Planning for Operations
- Lack of Staff Operating Experience
- Lack of Attention to Human Relations Matters
- Corporate Micromanagement
- Financial Pressures to Keep Plant Operating

Extensive resources and time are required to plan, conduct and document diagnostic evaluations. The large team size, mandated by the broad-based approach, coupled with the needed indepth preparation and planning, the three weeks of on-site review, and the time required to ensure a high quality report has resulted in a relatively large commitment of NRC staff resources and contractor support. The length of time required to prepare and finalize a fully-integrated, appropriately focused, well-written report has proven to be substantially longer than originally envisioned. Although a number of measures have been taken to increase report writing and editing efficiency, experience indicates that high quality diagnostic evaluation reports take a longer time to complete than the 6 weeks initially estimated. This is due to the continuing technical and root cause evaluations that occur in parallel with report preparation activities.

The most recent evaluations have each involved approximately 3.5 FTE of NRC staff resources and over $110K in contractor support. Licensee manpower costs to support DETs have also been significant. AP&L estimates that manpower to support the onsite work of the ANO DET was in excess of 3 man-years while APS estimates that about 2.5 man-years were expended to support the Palo Verde DET.

As currently structured, AEOD's DEIIB provides an experienced core of evaluators needed to staff and support each team. This core team ensures consistency in planning, implementation and report preparation quality. The authorized FTE level within DEIIB, coupled with the broad based evaluation scope and extensive length of time from evaluation initiation to report completion (about 4 months) would indicate that no more than four diagnostic evaluations can be completed per year with the current approach. To allow for additional evaluations and needed increased relief time for DEIIB staff, AEOD has initiated discussions with NRR to "institutionalize" the DET approach, i.e., to standardize the scope, methodology and report contents and establish an agency-wide roster for DETs. This approach would be similar to that used in the Incident Investigation Program.

The DEP has provided timely independent assessments of license performance to NRC senior management. These assessments have been valuable in augmenting and calibrating SALP, PI and NRC management perspectives. Diagnostic evaluations have also provided broad-based understanding of industry and individual licensee performance problems and insights into their underlying causes. The

adequacy and effectiveness of the actions being taken and the need for further regulatory actions have also been made more apparent from completed assessments.

Finally, NRC Diagnostic Evaluations have had important tangible but indirect benefits such as assisting licensees in better understanding their own performance weaknesses to underscore and bring focus to the need for performance improvement.

Despite the success of the DEP, efforts will continue to be made to refine the diagnostic evaluation process to improve the team efficiency and effectiveness. Two extensive lessons learned assessments have already been conducted to refine procedures and a third is planned for early 1990. The sizeable number of NRC staff who have now participated in evaluations as team members or leaders has effectively established a core pool of "qualified" staff such that a more "institutionalized" approach and staffing of diagnostic evaluation teams as discussed above may now be possible. Current funding provides contractor support for management and engineering functional areas for three DEs per year. Additional DEs would require reductions in contractor support or reprogramming funds to maintain the quality and level of contractor support.

Summary of Conclusions

On the basis of our review, we have concluded that the goals and objectives of the DEP are being achieved. The DET methods and procedures have become well established, and have proven to be highly effective in assessing licensee performance as well as the underlying causes for performance problems. The capability has also been developed to assess, in a credible and comprehensive manner, management weaknesses as an underlying cause of performance problems. The use of management and engineering contractor support has been effectively integrated into these methods.

DETs have proven their value to the NRC and its senior managers by augmenting and calibrating SALP, PI and inspection perspectives on licensee performance, and by providing additional insights into the underlying causes for performance problems. Technical issues both plant-specific and generic in nature have also been identified by DETs. Although the costs of conducting a DE are significant in terms of NRC staff resource requirements and contractor support, the benefits to the agency have been substantial and the DEP has justified these costs. Overall, the DEP is now considered a mature and highly effective NRC program.

MANAGEMENT AND ORGANIZATIONAL FINDINGS AND LICENSEE RESPONSES

McGuire

Finding

The Design Engineering (DE) Department was not being fully utilized in day-to-day support of the operating stations. Accordingly, some McGuire technical issues which were not evaluated adequately by Nuclear Production Department (NPD) could have benefited from greater DE involvement. The role of DE was defined as providing support when specifically tasked by NPD. The NPD engineering personnel normally evaluated and solved technical problems and developed technical problems themselves, which tended to limit requests for DE assistance.

Response

Design Engineering has placed a permanent staff of six personnel at McGuire Nuclear Station. Similar staffs have been placed at Catawba and Oconee Nuclear Stations. The primary focus of site engineering offices will be to get involved in the day-to-day issues which arise at the station. The licensee's experience to date indicates that sometimes the site teams can directly meet the particular need of the station. At other times, the site office is the avenue by which General Office Design Engineering expertise is immediately brought to bear. In either case, DE is more quickly and more frequently involved in station problems than before creation of the site offices.

Fermi

Although there had been some improvement in interdepartmental interfaces, there was still a general lack of clarity in the interfaces among Nuclear Engineering, Technical Engineering, and Maintenance and Modifications. No written guidance existed to define the interfaces.

In October 1988, a joint Nuclear Engineering/Nuclear Production Task Force was established to address this important area. The task force has two major objectives related to this issue: (1) establish a clear definition of Nuclear Engineering/Nuclear Production Technical Engineering Group interface responsibilities, and (2) define areas within the Technical Engineering function where related design control activities might be shared. Actions to achieve these objectives are planned to be completed by March 31, 1989.

Findings	Response
Perry	
Management had developed an organizational culture at Perry on technical issues such as nuclear safety and quality that was a positive influence on performance, as demonstrated by a good work ethic, increased productivity of teams, and improving technical performance in several areas. There were also negative influences on culture, attitudes and morale caused by several personnel issues, and management had not yet responded as effectively to these culture-related personnel issues as they had to technical issues.	As a result of the diagnostic evaluation and the licensee's own internal assessments, the licensee committed to review job descriptions, job grades, and qualification requirements. As a part of this process, comparisons will be made not only with other similar jobs in the Company and the Nuclear Group, but also other nuclear utilities and Centerior. Corrective action has also been taken in several other areas having to do with personnel cultural issues and personnel administrative issues. These actions include additional supervisory training, United Way contributions policy change, the development of a new career opportunities program, salary administration reviews, and consistency in promotion policies.
Technical problem solving and decision making was consensus oriented and focused at the upper management level. Meetings significantly contributed to good daily teamwork and communication among the upper level managers. However, teamwork and communication were not as universally apparent at the lower levels of the organization.	Management communications and teamwork were readily evident; however, at lower levels of the organization it was not as apparent. We agree that there is room for improvement and have increased emphasis on communication by periodically meeting with all levels of our organization for question and answer sessions.
In some cases the working relations of Nuclear Engineering Department (NED) design engineers with Perry Plant Technical Department (PPTD) was poor. There was a lack of clear definition and communication of the NED engineer's roles, responsibilities and interfaces, relative to PTD system engineers, in supporting the plant. In addition, some NED system	In order to better clarify the role of the "system engineer" in NED, changes to department procedures are being developed. These changes will delineate the responsibilities of the NED system engineer to be cognizant of all the changes being made to his/her system. These changes will be in place by year's end.

Findings	Response
engineers were not cognizant of all the design changes being made to their assigned systems.	
Brunswick	
Current senior site managers were substantially involved in day-to-day plant activities and one of the most significant actions initiated had been to increase the amount of time managers spent in the plant. Additionally, these managers were sensitive to cultural issues and had implemented some corrective action measures, such as communications and team-work quality teams. However, there was not an overall effective means to respond to people issues.	Site management is increasingly involved in day-to-day plant activities, and continues to seek opportunities to address people issues. Several recent management initiatives have opened new channels of communication at Brunswick. In addition, Brunswick is planning a prototype suggestion program for implementation in late 1989. This program will encourage employees to make suggestions for improvements directly to site management. Further, the corporate focus on Total Quality and post-OA management criteria are providing additional impetus towards a more open, interactive culture.
The Corrective Action Program was inadequate. There was no focal point of root cause expertise within the Brunswick organization, the threshold criteria for formal root cause (by procedural guidance) was too high, and training given to date, concerning the various methods of root cause determination was rudimentary. Also, there had been a lack of corporate office sensitivity and commitment to the corrective action programs and processes throughout the Nuclear Generation Group. Additionally, Brunswick had not implemented a evaluation system to improve the analysis and evluation of human performance problems.	Root cause analysis is now being pursued much more rigorously under PLP-04, "Corrective Action Program." Improvements planned for the Brunswick Corrective Action Program include: (1) develop a Brunswick nonconfornance policy, (2) establish goals and incentives for self-identification of nonconformances, (3) issue revisions to PLP-04 to lower "threshold" levels and improve trending and training, (4) complete additional training on PLP-04, (5) identify a Brunswick corrective action program coordinator, (6) identify a senior HPES coordinator at Brunswick, and (7) further develop and effectively institutionalize the corporate Corrective Action Program throughout the nuclear program.

Findings	Response
The process for business planning at Brunswick was ineffective because it hampered effective communication within the site organization as well as between the site and corporate office on Business Plan/Budget related matters. It also resulted in a mismatch between the Five-Year Business Plan and Budget causing a substantial lessening of site management's sense of ownership of this plan. In addition, inconsistencies existed between current and future (projected) modification closeout rates as documented in the Brunswick Five-Year Business Plan. The Business Plan forecasted a significant drop in the number of modifications performed on a yearly basis. If the actual number of completed (operable) modification packages drops to be consistent with the Business Plan, the current modification backlog would not be reduced in a timely manner and might actually grow.	Several improvements are planned for the Brunswick business planning process including: (1) formalizing the process for initiating and finalizing budget and business plan targets; (2) enhance the business planning process to clarify the "roll down" from the long range plan and "roll into" the budget; (3) utilizing the business plan more effectively as a planning and management tool; and (4) improving consistency between the business plan, the long range plan and the backlog of modification projects. Budgeting and accountability for support department activities have been moved out of plant business plans to allow more focus of site management on the business of the site.
Management succession plans had been developed down to the supervisory level at Brunswick. However, little evidence of effective career planning and development existed, including job rotation.	Improved career development and job rotation processes will be developed and implemented.

ENGINEERING SUPPORT FINDINGS AND LICENSEE RESPONSES

Perry

Finding	Response
A large number of design changes and work orders were planned for implementation during the first refueling outage. However, significant equipment problems experienced during the initial startup and first operating cycle would not be fully resolved at this time. They included problems in the control complex chilled water and offgas systems, feedwater system vibration, fuse operating problems, and emergency diesel generator air receiver relief valve problems.	As a direct result of the Diagnostic Evaluation Team discussion of the Control Complex Chiller Water problems, the Independent Safety Engineering Group (ISEG) initiated a review of the system. This review will include the following: (1) review of operational history of the Control Complex Chillers and the Control Room Emergency/Recirculation System, (2) data search of industry operating experience, (3) determination of probable causes of individual problems, and (4) recommendation of possible modifications or operational enhancements. This review is in progress with a report expected by the end of September

Brunswick

The licensee had not been aggressive in identifying or closing out vendor recommendations. Many General Electric (GE) vendor recommendations were over 10 years old and were only recently being dispositioned. Scheduling and implementation of corrective actions (once dispositioned) were also inadequate and had not been revised to reflect current work work practices.	In May 1989, the vendor recommendation process was incorporated into ENP-20, the Engineering Work Request procedure. A planned revision to ENP-20 will incorporate the licensee's new Nuclear Prioritization Process which should provide for a more accurate priority for each item. These steps will allow vendor recommendations to be considered for scheduling and budgeting on an equal basis with other plant projects and improvements.
Plant modifications contained an excessive number of field revisions, marginal installation instructions, and failed to address known discrepancies between design requirements and as-built conditions, indicating a lack of attention to detail or competence	To assure appropriate understanding of root cause, the licensee recently performed a statistical evaluation of Brunswick plant modification field revisions, to characterize the type of changes and their related frequencies included in the field revisions. The licensee also plans to

Findings	Response
by the original design engineers and the design checkers/verifiers.	implement a program by the end (February 1990) of the Brunswick Unit 2 1989 refueling outage which initiates actions from lessons learned from reviews of plant modification field revisions and other indicators. It is expected that one benefit of this type of program is a reduction in the overall number of field revisions.
The design change program was in a state of change and not well supported by up-to-date site procedures. Conflicts between the "new" Company modification procedure and Brunswick procedures also existed.	Brunswick had initiated a plan to update site procedures to reflect organizational and responsibility changes. In recognition of the need for additional procedural and programmatic enhancements, the licensee established a standing committee in June 1989 with representatives from the three nuclear sites and the Nuclear Engineering Department. This committee provides the necessary guidance to resolve conflicts between the Nuclear Plant Modification Procedure and site procedures.
In some instances, the licensee appeared to lack an understanding of the design basis of the service water (SW) system, and the necessity for traceability of design input to design output. This was caused, in part, by a general lack of hydraulic design calculations for the SW system.	The SW system project discussed in response to the DET develops a design basis report for the service water system, documenting the basis for the hydraulic requirements of the system including calculations demonstrating compliance. Additionally, the licensee is planning to perform a safety system functional inspection (SSFI) of the Brunswick SW system in 1989.
In many instances, design basis information was not readily available, was in the process of being reverified, or could not be located. This situation, in combination with the SW system deficiencies just discussed, and similar deficiencies in the high pressure coolant injection (HPCI) system	Deficiencies identified during the review of the SW system highlight the need to evaluate, organize, and stabilize design basis information and identify and resolve concerns. The licensee plans to accomplish this include: (1) complete the United Engineers and Constructors (UE&C)/GE System Design Criteria

Findings	Response
found during the licensee's 1987 self-assessment, raises questions about the reliability and operability of safety and nonsafety equipment under credible off-normal conditions.	Documentation Turnover, the UE&C Piping Design Turnover, and the SW system SSFI (2) complete the SW modification review project plan being conducted as part of of the SW flow verification project. This review is structured to determine if modifications implemented after original design may have impacted that design in an adverse manner, and (3) evaluate results of the Modification Review and SSFI findings, and the HPCI and standby liquid control (SLC) SSFI results and open items, for trends, patterns and significance. Determine by June 30, 1990, the actions and priorities for additional steps to be taken.
Numerous design and operational weaknesses were identified with the SW system that collectively challenged its operational readiness. Examples included: a vulnerability to single failure, lack of nuclear to conventional SW header leakage testing, unavailable preoperations/ startup test data, improperly performed modifications, and the high potential for water hammer of the residual heat removal SW loop keep fill system. The licensee also failed to recognize existing nuclear SW system flow distribution and capacity inadequacies during the performance of SW studies and modifications. The licensee subsequently wrote a "justification for continued operation" (JCO) which included numerous short and long-term corrective actions.	In response to questions raised during the Diagnostic Evaluation, the licensee immediately initiated an SW system project team encompassing corporate and site engineering personnel. This team developed a hydraulic model based on as-built drawings and performed system testing including cross-tie valve leakage testing to validate the model. Accident scenarios were evaluated and a Justification for Continued Operation developed to support continued operation. This JCO implemented compensatory measures to ensure operability until design changes could be implemented. A project plan was developed to ensure appropriate short term and long term actions.
Weak engineering safety evaluations (10 CFR 50.59) were noted during review of modifications. The licensee had also made nonconformance reports (NCR) 88-055 and 88-056. Licensee corrective actions associated with the NCRs failed to	A corporate task force under the direction of Corporate Nuclear Safety is developing a consistent method for performing safety reviews. The charter is to incorporate the best features from the licensee's three nuclear

Findings	Response
address the concern or effect of poor, past evaluations, and the existence of potential unreviewed safety questions.	sites, corporate organizations, and the recent industry guidance by NUMARC on this issue. The results of this effort will be to raise the quality of the licensee's 10 CFR 50.59 reviews throughout the company. The corporate program for accomplishing this will be in place by February 15, 1990. Procedures and training necessary to implement the program at all three sites and the corporate office will follow.

SUMMARY OF ANO POTENTIAL SAFETY ISSUES

During the course of the DE, a number of issues were identified by the team that had an actual or potential safety impact and for which the licensee took actions to correct. In some cases, those actions were immediate and, for others, the licensee committed to review the issue and take appropriate actions in the future. The most significant of those issues and the related status are listed below.

Item	Status
1. A question was raised regarding long-term availability of the 14 acre emergency cooling pond (ultimate heat sink) under certain design-basis accident conditions. The maximum heat sink temperature could kill fish and block SW pump intake screens.	Following the DE, the licensee chemically treated the pond and later collected 1600 lbs of fish. The licensee plans a similar treatment in 6 months to determine long-term action.
2. An extra relay contact was found to have been incorrectly wired into the initiation logic circuitry of Unit 1 SW pumps P4A and P4C which had existed since 1974. The extra relay contact was not part of the design and under certain conditions would cause SW pumps 4A and 4C to fail to restart following ESF actuation.	An LCO was entered until the to contact was removed. An indepth inspection was conducted by the licensee in both units to ensure no other similar discrepancies existed. RIV followed up with a special inspection to review the licensee's actions.
3. Waterhammer in the Unit 2 SW to containment coolers that caused cooler tube leaks was identified by the DET as having degraded the reactor containment barrier on at least four occasions. The DET also found the worst case scenario for SW waterhammer had not been evaluated. This scenario would be during an actual ESF actuation with a subsequent loss of offsite power in which the SW return line would void.	The licensee completed an informal evaluation of worst-case forces from water-hammer and found these forces could exceed those produced during a seismic event. The licensee indicated plans to reassess water-hammer in the SW system and take corrective actions, as appropriate.
4. Unit 1 operating procedures did not direct the operator to align the power source for the auxiliary cooling water isolation valve to the same EDG used to power the SW swing pump. Had the operator failed to do so, a single failure vulnerability could exist in the SW system.	Temporary procedure changes pursuant to Technical Specifications were made while the team was onsite to direct the operators to align the power source properly.

Item	Status
5. Unit 1 operating procedures allowed a single failure vulnerability in the SW system in that cross-connect valves were normally left open. With the swing SW pump in service and with the loss of one EDG, an alignment could result with the running SW pump supplying both loops. This would result in insufficient flow to supply loads during an accident.	Temporary procedure changes pursuant to Technical Specifications were made while the team was onsite directing the operators to leave cross-connect valves closed.
6. Uncontrolled use of valve wrenches to open/close manual and motor-operated valves resulted in excessive force being applied to valve operators, damaging the valves.	Night orders and Nuclear Department directives were revised, prohibiting the use of valve wrenches by plant personnel until evaluated by maintenance/engineering.
7. The Unit 1 SW system contained several small nonseismically designed lines that were not accounted for in the design basis. An evaluation by the licensee during the DE showed the SW system could not provide the required flows for a LOCA if these lines were lost due to an earlier seismic event.	The licensee was investigating potential changes to the non-seismic lines to correct this deficiency.
8. The doorways between the two EDG rooms for both Units 1 and 2 were not protected to prevent flow of flammable liquid through the gap at the bottom of the doors.	The licensee was investigating the installation of barriers to prevent this potential carryover of fuel oil between rooms.
9. The design basis for the sizing of the backup air supplies for the air-operated valves in the Unit 1 containment cooler SW return lines was not documented. These valves were only tested to remain shut for 30 minutes following a loss of offsite power. No basis for the 30 minutes existed and appeared to be too short to ensure long term containment isolation following a LOCA.	Air-operated valve design bases were now scheduled to be addressed by the licensee.

Item	Status
10. The fuel oil day tank support design for the diesel-driven fire pump could result in a seismically induced fire that would also degrade the fire protection system and provide a fire source in the SW pump P4B power supply.	The licensee planned to modify the support holding the diesel driven fire pump fuel oil tank to hold it in place during a seismic event and also to install a curb to prevent the spread of any spilled fuel oil.
11. During control room observation, the NRC team members noted that Unit 2 operators were intending to isolate the SW supply to the EFW pump for maintenance without entering an LCO. Since the SW system represented the only seismically qualified supply to the EFW system, the team questioned that decision. This represented a broader need for training in the areas of operability determination and Technical Specification bases.	The licensee issued guidance to the operators regarding the need to bette understand the Technical Specification bases and issued a condition report to investigate the root causes of these problems.
12. Completion of inspection and testing recommended in a November 1988 Limitorque 10 CFR Part 21 report regarding failures of melamine torque switches was not scheduled until late 1990. No engineering analysis for continued operations had been performed in view of potential unqualified components in certain MOVs.	All MOVs subject to the Part 21 for Unit 2 were to be replaced during 2R7 outage in late 1989. A JCO was prepared for evaluation of operation of Unit 1 until the mid cycle outage in Nov/Dec 1989 and melamine switches for all MOVs subject to the Part 21 will be replaced during the mid cycle outage.
13. The Unit 2 design basis did not include the differential pressure limits across the intake bay screens to prevent damage to these screens and subsequent damage to the SW system. Also, the level (and differential pressure) instrumentation did not have a reliable source of power.	The licensee began to investigate these differential pressure limits and a reliable power source.
14. The effects of the SW strainer foundation damage on SW system operability were not assessed nor was the possible damage to the SW pump as a result of an unintentional reverse rotation combined with excessive vibration evaluated.	A condition report was initiated to evaluate concerns.

Item	Status
15. No LCO log entries were made for surveillances that removed equipment from service. There appeared to be no administrative controls to prevent multiple trains from being OOS simultaneously.	Management directed operators to document LCO log entries for surveillance testing.
16. Unit 1 operating procedures did not include the manufacturer's operating limits for the SW pump motors.	Operating procedures were scheduled to be revised to include the manufacturer's operating limits.
17. During ESF actuation and a loss of offsite power, natural circulation air cooling of Unit 1 SW pump motors was not in accordance with the design basis.	Openings were provided in the SW intake structure to allow natural circulation in accordance with the design basis.
18. Control of contaminated tools in the Hot Tool Room was severely deficient.	Actions were taken to ensure that the responsible contractor corrected the discrepancies.
19. Section XI IST testing was not being performed on Unit 2 SW pumps.	Appropriate testing on 2 of 3 pumps was performed while the team was onsite. Pump flow values were compared to manufacture's pump curves, and no degradation was noted.