APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report No. 50-382/92-01

Operating License No. NPF-38

Licensee: Entergy Operations, Inc.
Operations, Waterford
P.O. Box B
Killona, Louisiana 70066

Facility Name: Waterford Steam Electric Station (WSES), Unit 3

Inspection At: WSES, Unit 3, Taft, Louisiana

Inspection Conducted: January 6-10, 1992

Inspectors: R. Vickrey, Reactor Inspector, Plant Systems Section
Division of Reactor Safety

M. Runyan, Reactor Inspector, Plant Systems Section
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Division of Reactor Safety

R. Mullikin, Senior Resident Inspector, Division of Reactor
Projects

S. Butler, Resident Inspector, Division of Reactor Projects
(part time)

Accompanying
Personnel: J. Wigginton, Project Manager, Nuclear Reactor Regulation

Approved: T. F. Westerman 2-3-92
T. F. Westerman, Chief, Plant Systems Section Date
Division of Reactor Safety

Inspection Summary

Inspection Conducted January 6-10 and 30, 1992 (Report No. 50-382/92-01)

Areas Inspected: Routine, announced inspection consisting of evaluating the engineering and technical support activities, and the assessments and quality assurance (QA) audits of those activities. The engineering organization was reviewed for organizational structure and interfaces, manpower and work

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backlogs, scheduling and prioritization of work activities, and qualification and training. The quality of the engineering performed was evaluated by reviewing completed station modification and design change work packages. The QA audits and assessments of the engineering and technical support organization and the actions taken with respect to the assessments and audit findings were reviewed.

Results: In the areas of engineering and technical support activities, two violations involving the failure to identify temporary alterations to drawings in the control room and the failure to control a field design change were identified (paragraphs 2.1.1 and 2.1.2). Although the licensee had previously discovered a similar problem in the identification of temporary alterations to drawings in the control room, no apparent action was taken to prevent recurrence. The field design change was made without proper authorization and was not identified during the completed package review.

There appears to be a well planned and orderly transition to a new organization under Entergy Operations Corporate direction and oversight. The capability to interface and draw from all three sites and corporate appears to be a strength for Waterford 3 and Entergy Operations.

The design engineering organization appears to be interfacing well with other departments and morale appears to be high. The departmental work backlog has been reduced and overtime is minimal. A number of enhancements including design basis documents, design guides, and improved procedures are viewed as a positive influence. Although the turnover rate in design engineering has been 16 percent (18 personnel) in 1990 and 7.76 percent (9 personnel) in 1991, the licensee indicated that this could largely be attributed to the transition from a project to full design organization during the past 2 years. Approximately seven of these personnel transferred within the licensee's organization.

Modifications and construction engineering appear to have reduced the burden on design engineering and is providing a full time group to manage modifications.

In the last year, significant improvements have been made to the core training program for the technical staff and managers curriculum. The training has been expanded from approximately 7 days to 7 weeks with the intent to develop modular system packages for future training based on individual task assignments.

Plant engineering appears overall to be operating well with focused activities to reduce work backlogs. A high turnover rate of approximately 20 percent of system engineers in the last 2 years is viewed as a potential weakness. The licensee is initiating actions to enhance the capabilities of the system engineers.

Actions are being initiated to construct a building onsite to house design engineering and plant engineering. They are presently spread out over the site.

The modification program was observed to be fully proceduralized and operating very well. The number and depth of questions documented by various plant groups on the technical review sheets was noted as a strength. The failure to properly initiate a field change to a completed and reviewed modification was viewed as a weakness. The temporary alteration program overall was found to be very well controlled. However, failure to identify temporary changes to control room drawings; a problem that had been previously identified, but not corrected, was viewed as a weakness. The high visibility that open temporary alterations receive once a week in the plan-of-the-day meeting was observed as a strength.

The licensee has performed a comprehensive assessment of their engineering program and has initiated enhancements as appropriate. The assessment did not identify major programmatic deficiencies but did identify enhancements and a number of observations. The licensee has an in-house assessment capability with the oversight of the Entergy Operations corporate organization. Engineering initiatives already in place have been overlaid with enhancements from the engineering assessments.

DETAILS

1. PERSONS CONTACTED

Waterford 3 Personnel

J. Abisamra, Piping Engineering Supervisor
*R. Azzarello, Director Design Engineering
D. Baker, Director Operations Support & Assessments
*T. Brennan, Design Engineering Manager
*W. Brian, Plant Engineering Supervisor
C. Bruce, Electrical Engineer
O. Bulich, Mechanical Specialties Engineering Supervisor
J. Burke, Civil/Structural Engineering Supervisor
J. Carson, Mechanical Engineer
*A. Cilluffa, Maintenance Engineering Supervisor
D. Correa, Procurement Engineer
V. Coy, Electrical Lead Senior Engineer
*G. Davis, Manager Event Analysis Reporting & Response
*M. Ferri, Manager Modification Control
E. Fields, Electrical Lead Senior Engineer
R. Finch, Mechanical Specialties Engineer
D. Gallodoro, Procurement Engineering Supervisor
*T. Gates, Licensing Engineer
*T. Gaudet, Operational Licensing Supervisor
S. Ghanavati, Reliability Lead Senior Engineer
A. Grace, Engineering Training & Accreditation Supervisor
D. Gray, Electrical Engineer
*P. Gropp, Systems Engineering Supervisor
M. Gutierrez, Civil/Structural Engineer
J. Hoffpauir, Maintenance Superintendent
J. Holman, Safety & Engineering Analysis Manager
J. Hologa, Mechanical/Civil Principal Engineer
*J. Houghtaling, Director Plant Modification & Construction
J. Howard, Procurement/Programs Engineering Manager
B. Ingram, Civil/Structural Engineering Assistant
P. Jackson, Electrical Engineering Supervisor
*J. Johnston, Independent Safety Evaluation Group (ISEG) Manager
G. Koehler, Supervisor Nuclear Quality Assurance Audits
A. Larson, Electrical Supervisor Construction
*L. Laughlin, Licensing Manager
*T. Leonard, Technical Services Manager
*A. Lockhart, Quality Assurance Manager
D. Marpe, Mechanical Maintenance Supervisor
O. Martins, Mechanical Systems Lead Senior Engineer
*W. Mashburn, Manager Design Engineering, Entergy Operations, Inc.
R. Mathew, Piping Engineer
P. Melancon, Reactor Engineering & Performance Supervisor
R. O'Donnell, Instrument & Controls (I&C) Engineering Supervisor
*D. Packer, General Manager Plant Operations

G. Payne, Mechanical Engineer
R. Peters, Electrical Maintenance Supervisor
R. Pollock, Quality Assurance Specialist
P. Pri..nkumar, Electrical/I&C Principal Engineer
B. Proctor, Mechanical Systems Engineering Supervisor
K. Riser, Procurement Engineer
*P. Schlesinger, Systems Engineering Supervisor
*P. Sicard, Safety & Engineering Analysis Engineer
*R. Starkey, Manager Operations & Maintenance
*B. Thigpen, Plant Modification & Construction (PM&C) Construction Manager
*F. Titus, Vice President Engineering, Entergy Operations, Inc.
K. Walsh, Event Analysis & Reporting Lead Senior Engineer
K. Wilson, Civil/Structural Engineer
G. Wood, I&C Lead Senior Engineer

NRC Personnel

*P. Goldberg, Reactor Inspector, Region IV (RIV)
*R. Mullikin, Senior Resident Inspector, RIV
*M. Runyan, Reactor Inspector, RIV
*W. Smith, Senior Resident Inspector, RIV
*R. Watkins, Human Factors Engineer, Office of Research
*T. Westerman, Chief, Plant Systems Section, RIV
*D. Wigginton, Senior Projects Manager, Licensing, NRR
*R. Vickrey, Reactor Inspector, RIV

*Indicates those persons who attended the exit meeting conducted on January 10, 19[illegible].

2. ENGINEERING AND TECHNICAL SUPPORT ACTIVITIES

The inspectors evaluated the effectiveness of the Waterford 3 engineering and technical support programs in the areas of adequacy of staffing levels and experience, training, design changes, and quality assurance (QA) audits. The evaluation consisted of documentation and personnel interviews to verify that the license requirements included in the Technical Specifications (TS) and codes and standards were being implemented and that the commitments contained in the Updated Safety Analysis Report (USAR) and other correspondence were being followed.

2.1 Design Changes and Modifications (37700 and 37702)

2.1.1 Permanent Design Changes & Modifications (37700 and 37702)

The inspectors examined three design modification packages to verify that the design modifications were in conformance with the requirements of the TS, 10 CFR Part 50.59, the Safety Analysis Report, and applicable codes and standards. The packages reviewed were Design Change No. 3195, Revision 3, "SI-602 A(B) Valve Operators"; Design Change No. 3308, Revision 1, "Reactor Coolant Pump Seal Replacement"; and Design Change No. 3260, Revision 1, "Removal of Shutdown Cooling Auto-Closure Interlock (ACI)."

Design Change No. 3195

The inspectors reviewed Design Change No. 3195, Revision 3, for the replacement of the air operators on the safety-injection sump outlet valves (SI-602A and -B) with motor operators. This modification was developed in response to a concern identified in Licensee Event Report (LER) 89-07 that the original design criteria for sizing the instrument air accumulators did not consider the limiting accident scenario of a small break loss of coolant accident with loss of instrument air. The modification had been installed, but the design change package had not been closed.

The inspectors' review of the design change package revealed that a considerable effort had been made to identify and address all issues of safety significance created by the modification. All assertions and assumptions were well documented and reflected conservative engineering practices. The 10 CFR Part 50.59 safety evaluation was complete and well written. A strength was noted in the number and depth of questions documented by various plant groups on technical review comment sheets. The response made to each of the comments was ultimately accepted by the originator. The inspectors verified that plant operators had received training that described the changed operating characteristics of the modified valves.

Design Change No. 3308

The inspectors reviewed Design Change No. 3308, Revision 1. This design change consisted of replacement of the existing Byron Jackson reactor coolant pump seal cartridge with a CAN4 seal supplied by Atomic Energy of Canada Limited (AECL). The pump seal change was made to Reactor Coolant Pump No. RC MPMP0002B during Refueling Outage 4. The performance of the seal will be monitored and, as performance warrants, additional AECL CAN4 seals will be installed in the other reactor coolant pumps in accordance with this design change. The Byron Jackson seal was replaced because of poor reliability, which had often caused shutdown of the reactor coolant pumps to repair or replace the seals. The licensee expects the AECL CAN4 seal to be more reliable with a 2-cycle or better seal life.

The inspectors reviewed the evaluation performed in accordance with the provisions of 10 CFR Part 50.59 as well as an ALARA design-review checklist and fire-protection/safe-shutdown checklist. The safety evaluation was complete and well written and the checklists were complete. The inspectors noted that considerable engineering effort had been incorporated into the modification and that conservative engineering practices had been utilized.

Design Change No. 3260

The inspectors reviewed the completed package for Design Change (DC) 3260, concerning the removal of the shutdown cooling system (SDCS) auto-closure interlock (ACI). The ACI, along with the open permissive interlock, kept the SDCS from being overpressurized during normal operating conditions. These two interlocks were installed to ensure the SDCS and the reactor coolant system were separated during normal operating pressures. The ACI was designed to automatically shut the SDCS isolation valves, if open, when the pressure in the reactor coolant system exceeded 700 psi. The open permissive interlock prevented opening the isolation valves when pressure in the reactor coolant system exceeded 392 psi.

The original design of the ACI presented a potential conflict between two safety functions. When the SDCS is required, the suction valves must remain open. Failure of the suction valve to remain open as the result of the operation of the ACI interlock could result in the loss of the decay heat removal function. In an effort to improve the reliability of the decay heat removal function of the SDCS, Generic Letter 88-17 recommended that the ACI function be removed. DC-3260 was created to remove the ACI function.

The inspectors reviewed the licensee's design change package, which included a proper 10 CFR Part 50.59 evaluation. In addition, the inspectors reviewed the licensee's evaluations of the design modification for potential impact on the 10 CFR Part 50, Appendix R safe shutdown capability, and the environmental qualification requirements of 10 CFR Part 50.49. The inspectors found these evaluations to be good.

The inspectors reviewed the plant's controlled documents that were affected by the design change. The following documents were reviewed and found to properly reflect the design changes:

- Technical Specification 4.5.2.d.1, "Emergency Core Cooling System";
- Updated Final Safety Analysis Report, Sections 7.4.1.3.b), 7.6.1.1.1, 7.6.2.1, 9.3.6.2.1, and 9.3.6.2.2.d);
- Safety Injection System Design Basis Document W3-DBD-001, Revision 0;
- Operating Procedure OP-009-001, Revision 11, "Shutdown Cooling System";
- OP-010-001, Revision 14, "General Plant Operations";
- OP-500-011, Revision 11, "Annunciator Response Procedure - Control Room Cabinet M";
- OP-500-012, Revision 5, "Annunciator Response Procedure - Control Room Cabinet N"; and
- OP-903-025, Revision 3, "Surveillance Procedure - Safety Injection Tanks and Shutdown Cooling System Interlock Verification."

The physical installation of DC-3260 was performed using Work Authorization WA-99000406. The inspectors reviewed the completed WA and found that it was complete with all required approvals. Post-modification testing was successfully completed. However, on January 8, 1992, the inspectors compared selected portions of the design change with the actual installation and noted a discrepancy. Drawing LOU-1564-B424, Sheet 588S, "Pressurizer Pressure Isolation Relays," showed that Relay 63X4 should be terminated at Points C1, C2, and C5 on Terminal Board TBC in Auxiliary Isolation Panel 2. However, the actual relay terminations were at Points C1, C2, and C4. On the determination/retermination sheet in the WA, Terminal Board Point C5 was lined out, initialed, dated by the electrician, and changed to Point C4. This constituted a field design change but no documentation was initiated for proper review and revision of the applicable drawing. The termination, although not in accordance with the drawing, did not affect the electrical continuity of the circuit (Cable 30588C-SMB). After the electrician completed the work, an independent verification was made by quality assurance that the conductor had been terminated at Point C4. The completed DC package was reviewed without noticing that the drawing did not agree with the as-built configuration. The failure to control field design changes is an apparent violation of NRC requirements. (382/9201-02)

The inspectors reviewed the following drawings to determine if they were revised in accordance with the design change:

- B-424, Sheet 591, Revision 18;
- B-424, Sheet 595, Revision 23; and
- B-424, Sheet 596, Revision 19.

No discrepancies were noted in this review.

Conclusions

The modification program was fully proceduralized and operating very well. The number and depth of questions documented by various plant groups on technical review comment sheets was noted as a strength. An example where a field design change was made without review indicated a potential weakness in handling field design changes and in configuration control.

2.1.2 Temporary Modifications (37700, 37702)

The inspectors also reviewed three temporary modifications. The temporary alteration reports (TARs) reviewed were TAR 91-041, "Alternate Nitrogen Fill Path for Safety Injection Tanks 1A"; TAR 91-050, "Cutting and Capping Drain Line Downstream SI-209B"; and TAR 91-054, "Jumper of One Cell in Battery 3B-S." The inspectors reviewed licensee Procedure UNT-005-004, Revision 7, "Temporary Alteration Control," and determined that it properly controlled the process of performing temporary alterations (TAs) (modifications) to safety-related plant systems as required by the licensee's TS and 10 CFR Part 50.59. The procedure provided detailed instructions for the preparation, review and approval of TAs, maintaining the process, 10 CFR Part 50.59 screening, and final approval for installation of TAs. In addition, the licensee's procedure required that formal records be maintained of the status of TAs, that the need for independent verification of installation and removal be evaluated, and that the need for functional testing of alterations after installation or removal be considered and included in the package, if necessary. Finally, the procedure required periodic reviews of the records and any outstanding TAs.

The inspectors reviewed the licensee's listing of TAs and reviewed the log which was maintained in the control room. The log was complete and contained the necessary records for approved TARs. Selected TARs were reviewed to determine that they were complete and contained the necessary reviews, engineering evaluations, safety evaluations, and approvals for installation. The licensee currently had 16 TAs installed, down from a most recent high of 27 during the last refueling outage. The status of TARs was reviewed weekly during the licensee's plan-of-the-day meetings and emphasis was placed on minimizing the number of installed TAs by plant management.

The inspectors selected three TARs for review which included TAR 91-041, "Alternate Nitrogen Fill Path for Safety Injection Tank 1A," TAR 91-050, "Cutting and Capping Drain Line Downstream SI-209B," and TAR 91-054, "Jumper of One Cell in Battery 3B-S" (approved but not installed). The inspectors determined that the TARs contained all the required reviews and evaluations and were properly prepared and installed (except TAR 91-054). Two of the TARs showed considerable involvement by the licensee's design engineering organization. Specifically, TAR 91-054 contained detailed analysis of the battery's capacity margin during a 4-hour station blackout scenario. The analysis indicated that sufficient margin would be available, with one cell jumpered out, until April 1993. Design engineering involvement in TAR 91-050, as well as several other TARs generated to cut and cap safety injection system drain lines, consisted of piping analysis and evaluation to ensure that the TAs would not degrade the system. No problems were identified.

On January 7, 1992, the inspectors compared the control room TAR log with the controlled drawings referenced in the log. The drawings referenced on the three TARs reviewed had the required drawing tags (stickers) identifying that a temporary alteration existed. However, during a subsequent inspection of TAR 91-050 on January 9, the inspectors noted that the drawing tags were missing from Drawing LOU-1564-G167, Sheet 1, Revision 31, "Flow Diagram - Safety Injection." The inspectors reviewed the TAR log and found that TAR 91-050 was still open and that the tags should have been attached to the drawing. A review of the other drawings previously reviewed indicated no similar problems. The shift supervisor was informed of the drawing discrepancy and he contacted drawing control to add the missing drawing tags.

The inspectors subsequently discussed the finding with the individual in drawing control that was responsible for the drawing change out. The individual stated that on January 8, he replaced the control room drawing with the latest revision, but did not transfer the tags since he thought that the temporary alteration was closed out. It was noted that the placement of tags on the drawings, when the TAR was entered into the control room log, was proceduralized. However, there was no procedural requirement to transfer the drawing tags when drawings were revised. Instructions on this were done verbally.

Procedure UNT-005-004 requires that system engineering perform a review and audit of the TA program quarterly and after major outages. Once completed, this review is sent to the Assistant Plant Manager, Technical Services. The inspectors reviewed the most recent TA program review which was completed on

October 16, 1991. This review was excellent in that it accounted for all open TARs and included a physical walkdown, where possible, for all the TAs. The inspectors noted that a finding from the licensee's review was that TA tags were not installed on all of the control room's affected drawings. The inspectors discovered that the licensee's corrective action for this finding was to install the tags on the affected drawings. This finding was not entered into the licensee's corrective action program. Thus, no root cause analysis was performed and no action was taken to prevent recurrence of the problem. The failure to control changes to drawings is an apparent violation of NRC requirements. (382/9201-01)

Conclusions

The temporary alteration program was found to be very well controlled. Noteworthy was the high visibility that open TAs received during the plan-of-the-day meetings. However, attention is required to assure that TAs are noted on revised documents provided to the control room.

2.2 Offsite Support Staff (40703)

2.2.1 Entergy Operations Corporate Engineering

The corporate engineering staff reports to a vice president of engineering located in Jackson, Mississippi. The staff is composed of approximately 40 budgeted positions with 8 vacancies. The director of design engineering for each of the three Entergy sites also reports to the vice president of engineering. The corporate staff is composed of an engineering analysis section, engineering programs section, and an engineering support section.

The engineering analysis section functions include fuel fabrication contracts, core-reload design oversight, reactor-physics analysis, and thermal-hydraulic, and transient-analysis support.

The engineering programs section provided technical support in the areas of welding process metallurgy, flow and materials evaluations. In addition they facilitated the activity of peer groups in assigned areas, and maintained awareness of and tracked industry issues.

The engineering support section provided technical support in the areas of procurement engineering, facilitated the activity of peer groups in assigned areas, and maintained awareness and tracked industry issues.

The major activities and objectives of the Entergy Operations corporate organization are set forth in the Entergy Operations 5-Year Business Plan. Each site is responsible to input and implement the business plan. Waterford 3 design engineering has a design engineering strategic plan which they are in the process of updating to better plan and focus their program efforts. The final formalization of the transition of engineering direction to the Entergy Operations corporate was observed to be in-process. Four corporate directives were being drafted to formally provide corporate direction and expectations for each site. These were to be issued by the end of February 1992.

The directives are designated as:

- Design engineering excellence (objectives and goals);
- Design engineering (divisional responsibilities);
- Configuration management; and
- Design process.

Among the principal requirements of the directives, each site is to develop objectives and goals based on these directives down to the working level. Performance indicators are to be developed to support performance monitoring. Periodic site engineering director meetings are being scheduled at least once per quarter with the vice president of engineering to discuss the status of engineering activities. A monthly report is provided by each site engineering director to summarize key activities and problems. A functional review by the vice president of engineering is planned to occur twice a year. Peer groups utilizing personnel from all three Entergy Operations sites are being formed to provide direction in designated areas and will be reporting progress quarterly.

The corporate engineering activities are included as a part of a Entergy Operations procedures manual. Design engineering standards and guides as they are developed are to be promulgated in a design engineering administrative manual.

Entergy Operations engineering peer groups, composed of a corporate manager designated as a sponsor and members from each of the three Entergy sites, have and are being formed to:

- Exchange information and ideas related to specific technical issues, procedures, and processes;

- Provide a mechanism to develop and maintain consistency in methodologies utilized, principles implemented and programs developed, while allowing for logical differences between implementation at each site. The differences are to account for different site organizational structure, plant design and commitments to standards and codes; and

- Identify opportunities to improve quality and cost effectiveness.

There are presently 18 designated peer groups. The inspectors observed that charters have or are being developed for each group for approval by the Vice President, Engineering Entergy Operations. The peer groups include the following:

- Configuration management;

- Computer aided drafting;

- Training;
- Procurement engineering;
- Computer applications;
- Fire protection;
- Piping stress and support;
- Probabilistic risk assessment and individual plant evaluation;
- Safety analysis;
- Motor- and air-operated valves;
- Electrical design (including electrical portions of Appendix R, "Station Blackout, DC Voltage Drop," and Regulatory Guide 1.75);
- Civil/mechanical design;
- Environmental qualification;
- Seismic qualification;
- Instrument and control;
- Welding and inspections (including Section XI, "Inservice Inspection, Inservice Testing, and Repair and Replacement");
- Security; and
- Business practice.

Conclusions

- The inspectors observed that there appears to be a well planned and orderly transition to a new engineering organization under Entergy Operation Corporate direction and oversight.
- Waterford 3 and each of the Entergy sites will maintain responsibility for the design activities onsite.
- The formation of peer groups are an important part of the development of the engineering direction for Entergy Operations and Waterford 3.
- The inspectors observed that some planned activities, such as utilization of the probabilistic risk assessment as part of plant and engineering activities, and coordination of future reload activities, appear dependent on the timely actions of the assigned peer groups to develop direction for these areas.

- The interviews of licensee personnel indicated that the ability to interface and draw from all three sites and corporate has been a major strength for Waterford 3 and corporate.

- The inspectors indicated that licensee's completion of the transition and issuance of the corporate directives will be monitored during future inspections.

2.2.2 Design Engineering

Organization Structure

The inspectors reviewed the design engineering organization structure and interfaces. The design engineering staff onsite report to the Director, Design Engineering. The Director, Design Engineering reports directly to the corporate Entergy Operations Vice President, Engineering and has a dotted organizational line to Waterford 3 Vice President, Operations. The Director, Design Engineering is responsible to establish the standards and performance criteria for design engineering personnel in accordance with company and Waterford 3 goals, directives, and criteria established at the executive level. The Waterford 3 Vice President, Operations controls the engineering budget and the authorization for design changes to be implemented. Reporting to the Director, Design Engineering are three groups. These groups are safety and engineering analysis, procurement/programs, and design engineering. In addition, on the Director's staff is a management training position and an associated analyst. There are 129 budgeted positions, including clerical, with approximately 4 vacancies.

The safety and engineering analysis group is made up of five personnel that provide: thermal-hydraulic transient and accident-analysis support; oversee the thermal-hydraulic and accident-analysis portion of the reload analysis supplied by the fuel vendor; develop and maintain the probabilistic risk assessment (PRA) model for serve accidents; perform PRA studies to address safety and licensing issues; support responses to the NRC; review TS changes and design changes; provide thermal-hydraulic support in evaluation of plant response and unusual configurations; and manage outside contracted service related to thermal-hydraulic accident analyses.

The procurement/programs group is composed of 27 budgeted personnel. There are two subgroups consisting of procurement engineering and programs engineering. The procurement engineering group is responsible to ensure that materials and procurement services are specified correctly, procurement specifications for plant replacement items are properly prepared, discrepancies are properly resolved, commercial grade items are dedicated for safety-related use when appropriate, procurement data base is updated and that the materials tracking and interfaces function properly. The programs engineering section has three groups composed of database maintenance, environmental qualifications, and inservice inspections. The data base maintenance group maintains the system information management system (SIMS) current with plant configuration; inputs the maintenance history data base and SIMS for work authorization (WA) on-line maintenance; initiates INPO failure reports and inputs to the Nuclear Plant Reliability Data System; maintains component numbering, labeling, and safety function classification; and issues the component failure analysis report. The inservice inspection group has responsibility for the 10-year inservice inspection program, the erosion/corrosion program, steam generator eddy current testing program, normal operation pressure test program, scope of hydrostatic testing program, microbiologically induced corrosion program and the lift rig inspection program. The EQ group has the responsibility for the environmental qualification program including the qualification of equipment, establishment of operational and maintenance EQ requirements, maintaining EQ files and the EQ list in SIMS, supporting daily plant operations and the design/procurement EQ related issues, and the review of completed WAs to assure they do not impact the EQ program.

The design engineering group consist of 90-budgeted positions and is composed of three subgroups. These subgroups include engineering support, electrical/instrument and control, and mechanical/civil. The engineering support section is responsible for configuration-management controls within design engineering, coordination of design basis issues and program, providing drafting and computer-aided drafting services, coordinating the administrative processing of department documentation, maintaining the engineering library, and coordination of the actions for all condition identifications and work authorizations assigned to design engineering for input. The electrical/instrument and control (I&C) section prepares design changes as both a lead and support role, supports the plant and operations as requested, assists procurement engineering and licensing as requested, assures timely completion of operability reviews, maintains design based document (DBD) and section standards and guides, manages outside contracted services, reviews fire-protection-related design changes and evaluations of deviations from tested configurations, maintains and implements the electrical and fire protection programs, and maintains and implements the I&C programs (setpoints, scaling, control board human factor engineering evaluations and other such programs). The mechanical/civil section have the same basic functions as the electrical and I&C section where applicable to mechanical/civil issues. In addition, this section maintains the mechanical/civil programs such as seismic equipment evaluations and qualifications, piping system analysis, and mechanical/civil calculations.

Procedures

The licensee identified and reviewed with the inspectors the procedures related to engineering functions. The procedures identified are as follows:

- Entergy Operations company directives (C7.xxx series);
- Waterford 3 SES site directives (Wx.xxx series);
- Waterford 3 SES administrative procedures (UNT-xxx.xxx series);
- Nuclear operations procedures (NOP-xxx series);

- Nuclear operations engineering and construction procedures (NOECP-xxx series);
- Nuclear engineering and construction instructions (NOECI-xxx series);
- Plant engineering procedures (PE-xxx-xxx series);
- Nuclear engineering department procedures (NE-xxx-xxx series); and
- Fire protection procedures (FP-xxx-xxx series).

Plant Operations Interfaces with Design Engineering

The inspectors reviewed with the licensee the design engineering interfaces with the plant. During daily operations, the Director, Design Engineering and the Manager, Design Engineering, or their designee attended the plan-of-the-day meeting each morning. The Manager, Design Engineering has an engineering (nonvoting) member assigned to attend all plant operating review committee meetings.

In direct support of operations, when NOP 19, "Nonconformance/Indeterminate Qualification Process," is involved because of questions related to plant operability, design engineering has a 24-hour time clock to provide a formal engineering operability determination. Engineering in support of this function has developed generic design guides. NRC is typically informed of the initiation of NOP 19 reviews and these determinations are typically reviewed by the resident inspector, the Region, and the Nuclear Reactor Regulation (NRR) assigned project manager. In addition, engineering performs review and evaluation of all "repair" or "use as is" nonconformance reports. The safety and engineering analysis group assists plant operations in post-trip reviews. Engineering personnel indicate that assists are initiated informally or can be initiated by problem evaluation information requests (PEIRs). There appears to be a free flow of information between plant system engineering and design engineering personnel as indicated during interviews. Design engineering provides assistance to system engineering in review of TARs when requested.

Interview of Design Engineering Personnel

The inspectors interviewed 24 design engineering department supervisors and engineers assigned to the civil-structural, mechanical systems, mechanical specialties, piping, electrical, I&C, and procurement engineering groups. The interviews were conducted for the purpose of determining how the engineering staff was functioning.

The overwhelming consensus of those interviewed was that design engineering had shown recent improvement. Interfaces between design engineering and other plant organizations were effective, upper management support was strong, and employee morale was high. The consistency of positive remarks indicated a high degree of professional satisfaction and team spirit.

Training provided to the employees was viewed as effective and appropriate and included instruction in root cause analysis, safety evaluations, and operability determinations. Technical training for new and experienced employees was provided, though not rigorously in all cases. Several managers stated that useful technical training for their more experienced employees was not typically available. Many of the engineers stated they would like to have more technical training offered.

The provision of resources in the form of newly-developed design guides, design basis documents, improved procedures, computer terminals, and early procurement of needed material was viewed as having a positive influence on the quality of work products.

One of the thrusts of the total quality improvement initiative was to empower employees with more input in developing technical solutions and approaches. This gives them more ownership in the final product. This philosophical policy shift was apparently being implemented and appeared to have been effective in increasing employee ownership.

Staffing levels of the engineering groups appeared to be consistent with the work load. Overtime averaged 10 percent or less. Backlogs had been reduced to very manageable levels. The staff's average nuclear experience was around 10 years and each engineer was degreed in an engineering or technical discipline.

Conclusions

The design engineering department appears to be interfacing well with other departments and morale is high. The department backlog has been reduced which has resulted in minimal overtime for the engineers. Design basis documents, design guides, and improved procedures supplied to the engineers are viewed as a positive influence on design engineering job performance.

2.2.3 Event Analysis Reporting and Response

The events analysis reporting and response manager reports to the general manager plant operations. The staff consisted of three departments: shift technical advisors, event analysis and reporting, and reliability engineering.

The shift technical advisors consisted of 11-budgeted positions with one vacancy. This department appeared to provide a good interface with their operations shift support. They usually were called on to provide the first start at analysis activities which was seen as a good progression in getting the important facts early in the process. In addition, the Shift Technical Advisors were responsible for:

- Hydrostatic test program;
- Local leak rate test program;
- Pump and valve in-service test program; and
- Post-test/trip review.

The event analysis and reporting engineers consisted of five-budgeted positions. This department coordinated the process and tracked the progress of root cause investigation and corrective actions. A computer-based tracking system was in place to identify responsibilities and when responses were due. Follow up action on late responses was accomplished through verbal contact followed by a memorandum for record purposes. Monthly status reports were distributed to responsible managers and overdue actions were trended by departments. Timeliness had been improved through reorganizational changes and the department was working towards improvements in prioritization. The department felt they had appropriate management support and that the continual increasing number of support personnel receiving root cause training was a benefit to their performance.

The reliability engineering department consisted of three-budgeted engineers and an analyst. This department was responsible for monitoring overall plant equipment performance and evaluating the effect of recurring problems on overall plant availability. The department compiled quarterly trend reports and through inter-office correspondence provided system engineers with performance data on various systems and in the Quarterly Trend Report for their review and information. Each indicator was analyzed within specific criteria and followup corrective actions were scheduled as deemed necessary to improve equipment and/or personnel performance. These reports were reviewed by the inspectors and found to contain a very detailed analysis of the items presented.

Conclusions

The events analysis response and reporting departments appear to be interfacing well with other departments. Their efforts to reduce backlogs and streamline processes should allow them to expand the services that they provide to the plant.

2.2.4 Plant Engineering

The Plant engineering superintendent reports to the technical services manager. The staff consisted of five departments, chemistry, staff engineers, electrical/HVAC system engineering, mechanical system engineering, and reactor engineering and performance, reporting to the plant engineering superintendent.

Plant engineering was aggressively pursuing the reduction of backlog items. The system engineering backlog of problem evaluation information requests (PEIRs) had been reduced from more than 200 in 1990 to less than 50 in 1991. The next planned focus was to reduce the condition identification/work authorization (CIWA) backlog. In addition, they were pursuing procedure changes that would clarify and simplify the CIWA and PEIR process. The licensee attributed the backlog reduction progress to a new team work approach, which made better use of other personnel resources. Along these lines the department held a planning meeting each morning. This meeting provided input from the duty engineer who had attended the operations shift turnover and the plan-of-the-day meeting. Discussions included an explanation of what was being done in the plant and why those actions were being taken.

The electrical and mechanical system engineering departments consisted of 23-budgeted positions with 5 vacancies. Both departments reported to the plant engineering superintendent. The main functions of the systems engineering departments were to:

- Provide system expertise to operations and maintenance groups;
- Monitor system performance and provide recommendations for improvement;
- Develop TAs, nonconformance repairs, and nonconformance use-as-is packages; and
- Perform HVAC system TS testing.

Of the 141 systems in the plant, 119 were assigned to the system engineers in the system engineering departments.

The reactor engineering and performance department had eight-budgeted engineer positions (plus others for plant monitoring computer maintenance). The department reported to the plant engineering superintendent. The main functions of the department were to:

- Monitor reactor core physics parameters for anomalies and perform core related TS surveillance tests;
- Perform special nuclear material accountability;
- Monitor plant thermal performance and recommend improvements; and
- Maintain and improve plant monitoring computer hardware and software.

The system engineering staff had experienced a very high turnover ratio. Five have been lost in each of the last 2 years. There are approximately 20-budgeted positions within mechanical and electrical system engineering. The licensee had recognized this high turnover as a potential weakness. Although many of the previous engineers were still onsite in another capacity, the licensee was evaluating methods to enhance the capabilities of the system engineers. These methods included a new focus on training and reducing time on tasks that would allow more time for field activities and training.

Conclusions

The plant engineering department appears to have focused their efforts on the reduction of backlogs and other obstacles that would interfere with their primary functions. The department projected an attitude towards fixing real problems and moving on towards excellence. The high turnover rate in system engineering was reviewed as a potential weakness.

2.2.5 Maintenance

The maintenance superintendent reports to the operations and maintenance manager. The maintenance engineering department reports to the maintenance superintendent. The staff consisted of 10-budgeted positions with one vacancy. The maintenance engineering department's three main functions were to:

- Provide day-to-day technical support to maintenance personnel on component level problems;
- Coordinate programs such as ASME Section XI, vibration program, lubrication program, motor operated valve program, check valve program, air operated valve program, and the maintenance portion of the EQ program; and
- Serve as system engineers for the main turbine and its auxiliary systems.

The department had a very low backlog of only eight action items. This total had been reduced from approximately 40 backlog items 6 months earlier. The reduction had been attributed to establishing a tracking system to provide for a greater management focus. Most of the departments' programs were either developed or well into the development stage. The department goals were to allot more time in the field. This goal appeared quite feasible since design and system engineering were taking on some of the responsibilities that previously had required maintenance support.

Conclusions

The maintenance engineering department appeared to have a well-focused plan. Their support of maintenance activities appeared to be excellent.

2.2.6 Modifications and Construction

The modifications and construction departments have removed the burden of overall project management from design engineering. The department has become the focal point and responsible department for station modifications. They act as the coordinators of the various departments within nuclear operations involved in station modifications. They developed new procedures to produce a more logical, streamlined and quality process. The new procedures require more front-end input to the design process from plant personnel and implementing group personnel. Walkdowns were implemented into the design, construction and turnover to operations stages.

Conclusions

The modification control concept appears to have functioned favorably serving a dual purpose of reducing the burden on design engineering and providing a full-time group to manage modifications.

2.2.7 Technical Staff and Manager Training

The inspectors reviewed the licensee's training program for Waterford 3 technical staff. All new technical staff members were required to complete an introductory training program within 6 months of assignment to their department. The introductory training requirements consisted of 14 training courses. In addition to, and in conjunction with the introductory training was an initial training program. The initial training program (orientation training) consisted of 18 (12 of which were a part of the introductory courses) core courses and one optional advanced training class. The goal of the initial training was to ensure that technical staff personnel possessed knowledge, skills, and experience necessary to perform their assigned duties in a competent manner. An individual once enrolled in the program had 2 years to complete initial training. The training program also contained a continuing training phase. The continuing training goal was to ensure that technical staff personnel maintain and improve their skills and be cognizant of applicable plant physical and procedural changes, codes and standards changes, changes to regulatory requirements and lessons learned from industry and in-house operating experiences that affect their job performance.

The licensee's development of this training plan had been taking place for less than a year and was in the process of being implemented. The development of the program included the use of industry and generic programs for job-task analysis. The core program had been expanded from approximately 7 days to approximately 7 weeks. A 4-week advanced systems course, which included simulator time, had been added to the program. The first of these advanced classes was scheduled to begin late in January 1992, with the training department planning to continue to offer it one or two times a year. The student composition of the 25 available billets for the January course included 7 for system engineers and 5 each for design engineers and modification and construction engineers. The training department also was planning to develop modular system packages for future training on individual systems. The training department had been meeting with the training committee on a monthly basis and indicated a new attitude toward improving training.

Conclusions

The technical staff and manager training program appears to have made significant improvements in the capabilities of the last year. The implementation of these improvements should enhance the technical staff personnel. The actual benefits of this program should be realized in the future when fully implemented.

2.2.8 General Observations Related to Engineering

Engineering Experience

The licensee provided the inspectors with the following status of engineering experience at Waterford 3.

	Avg. Exp Years	Nuc. Exp. Years Avg	W-3 Exp. Years Avg	PE Lic.	Total Eng.
Site	13.49	9.4	5.76	17%	170
Design	14.47	9.74	5.81	24%	91
Plant Engineering	11.16	7.03	4.65	6%	33
Modification	14.47	11.79	7.74	5%	20
Maintenance	14.09	7.45	7.18	36%	11

Design Engineering Turnover Rate

The licensee provided the following:

YEAR	NUMBER OF PERSONNEL	NUMBER OF OPENINGS	NUMBER TERMINATED	TURNOVER RATE
1990	112	9	18	16.07%
1991	116	5	9	7.76%

Although this turnover rate appears to be substantial, the licensee indicated that it could largely be attributed to the Waterford 3 transition from an engineer project organization to a full-design organization.

Modification Prioritization

A change review panel reviews all modification packages and prioritizes each. The vice president operations subsequently approves all packages.

Design Change Package Backlog

The backlog of active design change packages has run less than 200 for the past 3 years as compared to over 1000 in the 1987 time frame at the time of refueling number one. The overall trend is to start working DCPs early each fuel cycle as indicated in the Attachment so that each package is completed prior to the refueling outage. The licensee indicated that the 10 packages completed during refueling outage four were largely due to their erosion/corrosion. The DCPs related to this effort may not be initiated until the inspection portion of the program which occurs during the outage has been conducted.

Engineering Problem Evaluation Information Request (PEIR) Backlog

The backlog of active PEIRs for design engineering has been running around 50 since the start of the second quarter of 1991. It had been as high as 250 in 1988. System engineer PEIRs have been less than 50 for the last 3 months, down from as high as 225 in 1990.

Individual Plant Evaluation (IPE)

The IPE is due to be submitted to the NRC in August 1992. Plant design has been frozen since refueling number three and the licensee indicated that all subsequent design changes will be reviewed prior to submittal.

Overtime

Minimal overtime has been required of engineering personnel. The licensee indicated that refueling outages are targeted for 60 days or less to minimize the time when there is normally increased overtime.

Design Engineering Task Analysis

The following percentages indicate the division of manpower utilization based on the total man-hours expended by the design engineering organization in 1991:

	Percentage
Administration	25
Outage Support	0.7
Management/Supervision	0.2
Engineering Enhancement	11.9
As-Built Effort	0.6
Plant Support Modifications	17.6
Plant Support Daily	37.8
Training	6.1

Task Tracking

Waterford 3 licensing utilizes a commitment tracking system to maintain the status of internal and external commitments. Engineering utilizes a PILE scheduling program to track activities and a resource loading schedule to show man-power loading.

Outside Contractors

Waterford 3 considers their engineering organization to be a fully design capable organization. Combustion Engineering (NSSS for W-3), Impell, and Ebasco (AE for W-3) were stated by the licensee to be used for task oriented assignments.

Engineering Building

It was indicated that initiatives are under way to construct an engineering building to house both design engineering and plant engineering onsite. Both organizations are onsite but are spread out. It was indicated that ground breaking is scheduled this spring.

2.2.9 Assessments and Initiatives

Assessment

Entergy Operations [redacted]rporate organization that performs assessments. They assisted corpo[redacted]ineering in performing an assessment of Waterford 3 engineering in June [redacted]y 1991. The assessment was performed following the NRC Electrical Distribution Inspection to provided Entergy Operations with an assessment of Waterford 3 major design engineering programs and to bring together peer groups from all the Entergy Operations sites. The assessment involved 17 teams and over 50 representatives from the 3 sites. The assessment did not identify any major programmatic deficiencies but did identify program enhancements and additionally provided a number of observations. An enhancement was defined by the licensee as a program improvement which is considered necessary to bring the program to a new higher level based on today's industry and regulatory expectations. Observations were considered optional.

The inspectors reviewed the status of the licensee response to the enhancements and found that all have been entered into the PILE scheduling program. All were generally on schedule for completion with exception of the issuance of procedures which were in the final review process. In addition the licensee had not been able to complete the three safety analysis design basis documents scheduled for completion by the end of 1991 and are revising the schedule to produce only three during 1992. The licensee has found the generation of these documents are taking longer than initially anticipated. The completion of the Fire Hazard Analysis will be delayed into 1992 versus the end of 1991. The change in schedules was discussed in December 1991 with NRC Region IV by telephone.

A significant number of the enhancements were related to original design calculations. A number of enhancements were related to design basis documentation and some were related to specific enhancement in design control/configuration management. The recommendations from these enhancements were also overlaid on the already on-going design engineering initiative programs.

The inspectors reviewed the status of the assessment observations. The licensee indicated that the observations would be entered into the PILE scheduling program and either closed out with no action or acted on as deemed appropriate.

In addition, the inspectors reviewed the licensee's plant assessment capability. This activity is accomplished through programmatic audits performed by the site QA organization. The QA audit reports contain observations and findings. Observations related to assessment-type issues in that they generally indicate actions that could improve a particular process. Actions on the QA observations appear to vary since they are not compliance based and no formal response is required. Following each audit, QA findings (compliance issues) are directly followed up on and a response is required.

The inspectors did observe that problems with computer software control had been identified in a licensee June 1990 audit and again during the engineering assessment. The inspectors observed during the interviews with personnel that each engineering group had their own instructions to control software which as an engineering assessment enhancement are being consolidated into one engineering instruction. There was an indication during discussions with licensee personnel that software QA records associated with the software control program have been held by some of the individual groups rather than placing them into the QA records system. The software control procedure is due to become effective March 1, 1992. A licensee QA audit is also scheduled for mid-1992 which should indicate the status of activities relative to the new procedure.

Plant assessments are also performed by the operations support and assessment group which includes the Independent Safety Evaluation Group. This group is completely separate from the QA group and report directly to the vice president of operations. The activities of this group were observed by the inspectors to concentrate on assessing daily specific activities of the plant and did not look at overall functional areas such as engineering, procurement, and other such areas.

Licensee Engineering Initiatives

The already existing engineering initiatives were overlaid by the enhancements identified during the engineering assessment performed in 1991. The Waterford 3 engineering initiative programs included the following:

- Electrical calculation update;
- Instrumentation setpoints program;
- Design basis documentation program;
- Computerized cable and conduit list;
- Fire protection program;
- Procurement engineering;
- CAD and scanner;
- Probabilistic risk assessment;
- Cobalt reduction program;
- As-building program;
- Nuclear plant reliability data system;
- Computer use plan;
- Design engineering staffing; and
- Human factoring of procedures.

Conclusions

The licensee has performed a comprehensive assessment of their engineering program and has initiated enhancements as appropriate. The licensee has an in-house assessment capability with the oversight of the Entergy Operations corporate organization. Engineering initiatives already in place have been overlaid with enhancements from the engineering assessments.

3. EXIT INTERVIEW

The inspectors met with the personnel identified in paragraph 1 on January 10, 1992, to discuss the findings and conclusions reached during the inspection. The licensee personnel acknowledged the findings. No information was presented to the inspectors that was identified by the licensee as proprietary.

PAST REFUEL DESIGN CHANGE APPROVAL