## Appendix

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-313/93-01
50-368/93-01

Operating License: DPR-51
NPF-6

Licensee: Entergy Operations, Inc.
Route 3, Box 137G
Russellville, Arkansas 72801

Facility Name: Arkansas Nuclear One, Units 1 and 2

Inspection At: Russellville, Arkansas

Inspection Conducted: January 19-22 and February 8-12, 1993

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## EXECUTIVE SUMMARY

A team of NRC staff members conducted an inspection of engineering and technical support at the Arkansas Nuclear One (ANO) facility. The inspection was conducted January 19-22 and February 8-12, 1993.

The NRC team utilized the guidance provided in NRC Inspection Procedures 37700, "Design Changes and Modifications," 37702; "Design Changes and Modifications Program;" and 40703, "Offsite Support Staff."

The inspection team reviewed the engineering organization for organizational structure and interfaces, manpower and work backlogs, scheduling and prioritization of work activities, support of plant operations, and qualifications of personnel. The quality of engineering performance was evaluated by reviewing completed station modification, design change work packages, temporary modifications, and engineering disposition of nonconformance reports. The quality assurance audits and assessments of the engineering and technical support organization, and the actions taken with respect to the assessments and audit findings were reviewed.

The inspection team observed the following:

- The overall process for controlling design modification and other engineering activities appeared effective. Approval of modifications was limited to those that have been through a detailed screening process and are intended for installation.
- Design program implementing procedures were in place and ANO is in the process of completing their overall hierarchy of program procedures by the end of 1993.
- The modification packages and the safety evaluations were well prepared and conservative engineering practices had been utilized.
- The temporary modification process was found to be properly controlled and implemented. The 10 CFR 50.59 safety evaluations were well written.
- The engineering dispositions of nonconformance reports showed considerable effort, conservative engineering judgment, and comprehensive corrective action.
- The Entergy Operations, Inc. (EOI) peer groups continue to provide significant overall engineering direction for improvement.
- The new plant computer with interface to the site personnel computers was observed to be providing a number of benefits.
- Staffing levels appeared to be consistent with the workload.

- The training program appeared to be effective. EOI is in the process of issuing a corporate administrative training procedure which will provide overall corporate and management direction for design engineering.

- The relocation of design engineering to the site continues to improve the overall interface and working relationship with the plant.

- Employee morale appeared to be excellent which, in part, can be contributed to engineering facilities provided on site.

- The "Total Quality Improvement" program and the associated "Quality Action Teams" appeared to be making a significant improvement in site activities, such as modifications, welding, and preventive maintenance.

- The recently implemented drawing revision notice process appeared to have improved the revision and control of drawings.

- The program for controlling and updating vendor technical manuals was excellent with the exception of the minor concern noted in this report.

- The design bases program was well defined and adequate measures had been implemented to maintain the program documents current. The training of engineering personnel to implement the program was scheduled to commence in 1993 and all upper level documents are to be completed in 1994.

- The licensee was found to be properly reviewing and handling regulatory and industry correspondence.

- The engineering "betterment" projects were viewed as positive initiatives with a long-term benefit for ANO.

- The diversity and capability of the nuclear engineering design group was observed to be an overall strength for ANO.

- The licensee's self-assessment process with regard to design engineering was viewed as a positive initiative and continues to demonstrate management attention to performance.

- Overall, the engineering organization and program was found to be effective and improving.

The inspection team identified a noncited violation regarding drawing revision notices not being incorporated within the procedural time limitation. This violation appeared to be an isolated occurrence and the licensee staff took prompt and effective actions to correct the problem and prevent recurrence.

In response to team observations, the licensee committed to review a selection of older calculations for hot water service relief valves to verify proper sizing. This issue will be tracked by an inspection followup item.

## DETAILS

### 1 ENGINEERING AND TECHNICAL SUPPORT ACTIVITIES

### 1.1 Design Changes and Modifications (37700 and 37702)

#### 1.1.1 Permanent Design Changes and Modifications

The team examined six design modifications to verify that the changes were in conformance with the requirements of the Technical Specifications, the updated safety analysis report (USAR), 10 CFR 50.59, and applicable codes and standards. The design change packages (DCPs) reviewed were:

- DCP 88-1033, "ANO-1 Rosemount 1153A Pressure Transmitter Replacement"
- DCP 89-2004, "ANO-2 Diesel Generator Air Start Pressure Switch Replacement"
- DCP 90-2027, "ACW Isolation Valve Override"
- LCP 90-5037, "Snubber Changeout and Drawing Reconciliation"
- LCP 90-6037, "EFW Valve Support"
- DCP 91-2016, "Pressure Code Safety Leakage Remediation"

The governing procedure describing ANO's process for controlling the initiation, scoping, development, approval, installation, and closeout of design modifications was Procedure 6000.010 "Design Control Process," Revision 5, Procedure Change 1. The team found that when plant personnel identified problems, which could result in plant modifications, they initiated a plant engineering action request, and non-plant personnel initiated an engineering action request, in accordance with the applicable procedures. If a modification was deemed necessary, the level of configuration control was determined based on the screening criteria provided in the procedure appendix. The simplest modifications were handled as plant change packages, the next level were limited change packages (LCPs), and the more complex changes were documented as design change packages (DCPs). Plant change packages and LCPs required significantly less planning, review, and documentation than the DCPs.

For DCPs, design engineering developed a project scoping report to identify the need for a design change, provide alternate solutions, and propose the recommended solution. The modifications engineer then prepared a project plan and was required to receive approval from the change review board, a group of senior management personnel, prior to the start of the detailed design. Upon approval of a project plan, design engineering developed the detailed DCP in accordance with Procedure 6010.001, "DCP Development," Revision 6, Procedure Change 3. The DCP consisted of an approval form, description of the change, design analysis, 10 CFR 50.59 review, a design basis review, several program reviews, and installation plan. Final approval for modification package installation was by the plant manager or general manager based on the recommendation of the plant safety committee. Minor administrative changes to modification packages were documented on field change requests, while more complex technical changes required design change package revisions. The team concluded that the process for controlling design modification activities appeared very effective.

1.1.1.1 Design Modification 88-1033

The team reviewed DCP 88-1033, "ANO-1 Rosemount 1153A Pressure Transmitter Replacement," which replaced 11 Rosemount Model 1153, Series A pressure and level transmitters for several applications within ANO-1. The replacement project was initiated due to the approaching end of qualified life for the environmental qualification units, the obsolescence of the Model 1153 Series A, and spare part unavailability. ANO analyzed the situation as documented in the project scoping report and decided to replace the existing Rosemount transmitters with the most current Rosemount option available for the particular application. This decision permitted ANO to utilize the existing mounting hardware. This modification also installed environmental qualified quick disconnect electrical connectors on the six transmitters within containment to enhance maintainability and minimize radiation exposure concerns.

The replacement transmitters would provide better accuracy, performance, and plant reliability with no change to component location or the design basis. The determination was made that this design change did not require a change to the USAR or Technical Specifications. The modification was adequately reviewed and approved by pertinent technical areas prior to installation. The team reviewed the safety evaluation and 10 CFR 50.59 reportability analysis and considered them to have been thorough and well written. Additional evaluations were made as part of the DCP, including reviews for ALARA, fire protection/Appendix R, human factors, environmental qualification, and environmental impact. The package also identified the affected document changes including drawings, procedures, vendor manuals, and calculations.

Installation and acceptance testing of the modification was completed during the 1992 refueling outage. The inspectors reviewed the physical installation of one of the pressure transmitters and found the unit to be installed in accordance with the approved design change. The team concluded that this DCP was well prepared and had received appropriate reviews to identify and address all potential issues of safety significance created by the modification.

1.1.1.2 Design Modification 89-2004

The team reviewed DCP 89-2004 "ANO-2 Diesel Generator Air Start Pressure Switch Replacement," which involved the replacement of four static "O" ring pressure switches with Automatic Switch Company (ASCO) pressure switches on the ANO-2 emergency diesel generator air starting system. The modification was initiated as a result of a concern with Static "O" Ring switches identified in a 10 CFR 21 notification and reiterated in NRC Information Notice (IN) 87-16 "Degradation of Static 'O' Ring Pressure Switches." The

Static "O" Ring Switch diaphragms were made of the material Kapton and were susceptible to permeation of ammonia and other chemicals present in the process medium, which could result in bubble formation and cause setpoint drift, increase in dead band, or failure to operate. ANO analyzed the problem as detailed in the Condition Report CR-2-88-0115 and the associated project scoping report and concluded the most feasible option was to replace the Static "O" Ring switches with ASCO switches, which have a stainless steel diaphragm and a fixed deadband.

The design basis for the pressure switches, which was to provide control signals to automatically start and stop the compressors when pressure setpoints were reached, was maintained with improved accuracy and reliability. This design change required a minor revision to the ANO-2 USAR, but did not require any changes in the Technical Specifications. The modification was reviewed and approved by the appropriate technical areas prior to installation. The safety evaluation and 10 CFR 50.59 reportability analysis were completed and potential safety issues were adequately analyzed. All the additional detailed evaluations were made as part of the DCP, and the listing of affected document changes including technical manuals, drawings, and the USAR appeared complete. Licensing Document Change Request Form 1062.03A was completed to initiate the USAR update and assure a description of the change would be included in the annual report as required by 10 CFR 50.59(b).

The ASCO switches and instrument tubing were required to be seismically mounted and supported per applicable specifications. The switches were seismically qualified per ASCO Test Report No. AQR-101083, Revision 1, which was verified to have met Arkansas Power and Light Specification No. APL-C-2502, Revision 2. Installation and acceptance testing of the modification was completed for each pressure switch separately in February 1992 by taking only one compressor out of service at a time to avoid rendering either diesel inoperable. The team inspected the physical installation of the modification for each of the pressure switches and found them to be installed in accordance with the approved design change. The team concluded that this DCP was clearly documented and implemented with sufficient engineering consideration of safety concerns.

1.1.1.3 Design Modification 90-2027

The team reviewed Design Modification DCP 90-2027 "ACW [Auxiliary Cooling Water] Isolation Valve Override," which modified the control circuitry of the two ACW system isolation valves. The purpose of this design change was to provide operators manual bypass capabilities to prevent the ACW isolation valves from closing in response to a spurious safety injection actuation signal (SIAS), main steam isolation signal (MSIS), or recirculation actuation signal while operating at full power. In addition, this DCP added the recirculation actuation override feature to the component cooling water isolation valves, which were previously modified with the SIAS and MSIS closure override feature. ANO initiated a project scoping report to address the problem and prevent recurrence of a non-design basis accident plant trip from 100 percent power that resulted from an inadvertent SIAS on December 1, 1988.

The design basis for this modification, found directly in IEEE Standard 279-1971 as referenced in the ANO-2 USAR, permitted administrative controls for manually bypassing channels of protective functions. Minor changes to the USAR were needed to reflect the new configuration, but Technical Specification changes were not required. The modification was reviewed and approved by the appropriate technical areas prior to installation. The team reviewed the safety evaluation and 10 CFR 50.59 reportability analysis and considered them to have been very detailed and well researched. All of the additional detailed evaluations were made as part of the DCP, and the listing of affected document changes including drawings, vendor technical manuals, calculations, and the USAR appeared complete. A licensing document change request form was initiated to assure USAR update. A detailed Human Factors Review Checklist Form 6010.01K was completed because the DCP modified annunciators on two panels. The review concluded that these modifications only enhanced control room alarm displays and operator's response efficiency.

Installation and acceptance testing of this design change was completed during the 1991 refueling outage. The team did not verify the physical installation of this design change. The team viewed that this modification adequately addressed safety considerations and was well prepared.

1.1.1.4 Design Modification LCP 90-5037

The team reviewed the Unit 1 Design Modification LCP 90-5037, "Snubber Changeout and Drawing Reconciliation," which modified existing snubbers to ensure that the snubbers at each location conformed with all of the manufacturer's recommendations such as the available stroke and swing angles. Some of the snubbers were modified by fabricating a new transition tube kit to correct the cold position setting. Other snubbers were modified by rotating the pipe clamp on the pipe to obtain an acceptable swing angle with the snubber to ensure that there was no binding. The modified snubbers were in the main steam system, primary sample system, and the reactor building spray system. The snubber modifications were considered safety related since the snubbers have a safety function of protecting the associated safety related piping systems during a seismic event. The snubber modifications were completed in 1992.

The team performed an inspection of the physical installations of the snubber modifications and found that the modifications were installed in accordance with approved drawings. The team found that the design modification package was well written and the DCP reflected conservative engineering practices. The team observed that the 10 CFR 50.59 safety evaluation determination for this modification was limited in detail. However, this safety evaluation determination was performed in 1990. The team reviewed Procedure 1000.131, "10 CFR 50.59 Review Program," Revision 0, dated May 31, 1991, and found that the safety evaluation determination process had been expanded and clarified.

1.1.1.5 Design Modification LCP 90-6037

The team reviewed Design Modification LCP 90-6037, "EFW Valve Support." This modification was developed to address the resolution of incorrect valve weights which were documented in Condition Report CR-2-90-0156 for Unit 2. The licensee had determined that Stress Calculations 951 and 936, which included two valves in the essential feedwater system, Tag Nos. 2CV-0798-1 and 2CV-0714-1, had incorrectly used a weight of 400 pounds for the valves when the actual weight of the valves was 1261 pounds. Due to the error in weight, this DCP included addition and modification of pipe supports for the essential service water piping which contained the two valves.

The team reviewed Stress Calculation 90-E-0031-01, which documented the operability for the system. The calculation proved that the piping system and affected pipe supports were within the operability limits and were acceptable for continued operation. The results did show that the pipe stress levels exceeded the normal/upset code allowables, which made it necessary to bring the piping system into full code compliance by modifying the supports. To bring the piping system into compliance, guide type supports were added to the operators of the valves and modifications to other supports were made. The team walked down the supports and found that the modification was installed in accordance with the approved design.

The team found that the safety analysis and various checklists were thorough and well written. The team also noted that the assertions and assumptions were documented and reflected good engineering practices.

1.1.1.6 Design Modification DCP 91-2016

The team reviewed Unit 2 Design Modification DCP 90-2016, "Pressurizer Code Safety Leakage Remediation." This modification was developed to address the resolution of the pressurizer safety valves leakage problem which had occurred every cycle since plant startup. The purpose of this modification was to improve the performance of the valves and to decrease the probability of a forced outage. As the length of time between outages increased, the leakage from the valves correspondingly increased to a point where heater capacity would have been challenged in the event of loss of offsite power.

The team found that the modification package included three tasks. The first was to reduce the nozzle loads on the valve to a value of less than 20 percent of the recommended allowables. This was accomplished by making the discharge piping more flexible by rerouting some of the piping and modifying a number of supports. The second task was to reduce the thermal shock related to drastic temperature rate changes, which was thought to be an initiating cause of leakage. This was accomplished by removing the existing metal reflective insulation on the top of the pressurizer head and replacing it with a low density, light weight fiberglass insulation. The fiberglass insulation was a more efficient, tighter fitting insulation. The third task was to eliminate the thermal lock on the reactor drain tank piping. The actual temperature of the drain tank piping was found to be somewhat higher than the design temperature due to the constant leakage of the pressurizer safety valves. Evaluation of the line showed a thermal lock caused by back-to-back supports. The stress levels were corrected by removing redundant supports.

The team reviewed the evaluation performed in accordance with the provisions of 10 CFR 50.59, as well as check lists and the impact on the USAR and

Technical Specifications. The team found that the safety evaluation was well written and complete. The team noted that a great deal of engineering effort had been incorporated into this modification and conservative engineering practices had been utilized.

### 1.1.2 Temporary Modifications

The team reviewed seven plant temporary modifications. The temporary modifications reviewed were:

- TM 92-1-023 Add two cells to the D06 battery
- TM 92-1-024 Add two cells to the D07 battery
- TM 92-1-033 Allow installation of new CRDM power cable
- TM 92-1-034 Replacement of undervoltage relays
- TM 92-1-035 Replacement of undervoltage relays
- TM 92-2-046 Reverse leads for RTD
- TM 92-2-049 Control element assembly read switch indicator

The team reviewed Procedure 1000.028, "Temporary Modification Control," Revision 16. The team concluded that the procedure properly provided for the control of temporary modifications to safety-related plant systems as required by the Technical Specification and 10 CFR 50.59. The temporary modification control procedure provided for the control of modifications for both safety related and nonsafety-related applications. The procedure established the requirements and methods for controlling temporary modifications. It assigned the responsibilities to the various groups associated with the modifications, and provided requirements and guidelines for periodic review of the installed temporary modifications. The procedure required that a monthly review was performed on each temporary modification to ensure compliance with the procedure.

The team reviewed the seven safety related modifications and found that the 10 CFR 50.59 safety evaluations were well documented. The modifications had received proper review and approval by the licensee. The team inspected the physical installations of mo[illegible] the modifications and found out that they were installed in accordance [illegible] requirements of the temporary modification packages. Temporary modification tags were installed for all of the modifications observed. The team reviewed the temporary modification log book in the control room as well as the control room drawings, which were stamped with the temporary modification number. The team observed that some of the electrical drawings, which were marked up in the modification package, were not available in the control room. The licensee explained that these specific drawings were not necessary for immediate reference to by the control room operators. If the operator found it necessary to look at the drawing, he would be required to review the drawing revision database on the computer, which would list any outstanding temporary modifications against it. The team concurred with this explanation.

The temporary modification process was found to be properly implemented. For the modifications reviewed, the 10 CFR 50.59 evaluations were well written, temporary modification tags were installed on all of the modifications, which were walked down, and the control room temporary modification log and control room drawings reflected the temporary modifications.

1.1.3 Engineering Disposition of Nonconformance Reports

Another key element of the design organization's support to plant operation was the review and disposition of condition reports, which document nonconforming conditions identified in the plant. The team selected for Review 9 condition reports, with a deliberate focus on items of safety significance requiring multi-disciplinary review. The following condition reports were reviewed by the team:

- 1-91-0157 Missing pipe hanger
- 1-91-0304 Improper use of environmental qualification data in heating, ventilation, and air conditioning calculation
- 1-92-0086 High emergency diesel generator frequency dip during loading sequence
- 1-92-0089 Failure of emergency diesel generator intake dampers to fully open
- 1-92-0127 Seismic anchorage deficiencies
- 1-92-0372 Thermal stratification in auxiliary spray line
- 2-91-0493 Seismic restraint not installed
- 2-92-0307 Emergency feedwater pump suction relief valve capacity low
- 2-92-0458 Bent valve stems

Each of the condition reports listed above showed considerable effort and, in general, the application of conservative engineering judgement. Action items, typically numbering 5 to 10 for each condition report, were systematically assigned to specific individuals and tracked to completion. A few of the action items associated with the reviewed condition reports were not completed at the time of the inspection. The action items as a whole represented a rigorous and comprehensive corrective action plan for each condition report.

The team held discussions with licensee engineers concerning several technical details associated with the listed condition reports. The engineers that were consulted showed good familiarity with the issues involved in the condition reports and appeared to possess a good measure of technical expertise. These discussions further indicated diligence in the effort to fully address all issues relevant to the identified condition.

Regarding Condition Report 1-92-0089, the licensee was unable to identify the root cause of the failure of the "B" emergency diesel generator (EDG) outside air dampers to fully open. The louvers were known to be operating successfully (90 degree opening) in November 1991, but were observed to open only 65 degrees in March 1992. Linkages in the louver assembly were adjusted to correct the problem. The licensee determined by calculation that the EDG could have met its Technical Specification operability requirements with the louvers in their as-found condition. Nevertheless, a more severe angular nonconformity may have rendered this EDG inoperable. The team was concerned that since the licensee had not identified a root cause and had thus subsequently not developed a corrective action plan, that a recurrence of equal or greater severity to the original problem was possible.

The licensee believed that the deficiency was in some way associated with a modification being installed at the time the condition was identified. This modification installed an indicating light in the control room that would illuminate when the louver opening angle fell in the range of 90 +/- 10 degrees. With the EDG being tested monthly, the remote indication of louver operation had been observed to indicate that the air dampers had operated successfully since the time the problem was first identified. The team concluded that although the licensee was unable to identify the root cause and initiate actions to preclude recurrence, the monthly monitoring of the louvers' performance will ensure that any such recurrence will be promptly identified. The team concluded that the licensee had acceptably addressed the identified condition.

The licensee satisfactorily answered all questions pertaining to the remainder of the reviewed condition reports, and no issues were left unresolved.

### 1.1.4 Relief Valve Sizing

During the inspection, the team discussed with the licensee the sizing of relief valves used in hot water applications where flashing could occur when the valve opened. If flashing occurred, the relief valve would potentially not be large enough to pass the required flow rate. The team reviewed Calculation 92-D-2010-02, "Relief Valve 2PSV-5200 Sizing and Discharge Reaction Force," dated August 5, 1992, and found that it had considered the effect of two-phase flow. The licensee committed to review a selection of older relief valve sizing calculations for hot water service relief valves to verify proper sizing. The review of the licensee's review of the sizing calculations is an inspection followup item. (313;368/9301-01)

1.1.5 Conclusions

- The overall process for controlling design modification and other engineering activities appeared effective. An approved modification was limited to those that have been through a detailed screening process and are intended for installation.

- Design program implementing procedures were in place and the licensee is in the process of completing their overall hierarchy of program procedures by the end of 1993.

- The modification packages and the safety evaluations were well prepared and conservative engineering practices had been utilized.

- The temporary modification process was found to be properly controlled and implemented. The 10 CFR 50.59 safety evaluations were well written.

- The nonconformance reports dispositioned by engineering showed considerable effort, conservative engineering judgement, and comprehensive corrective action.

- In response to team observations, the licensee committed to review a selection of calculations for hot water service relief valves to determine if a sizing problem exists.

1.2 Offsite Support Staff (40703)

All plant engineering activities on site reported to the ANO Vice President, Operations. The ANO Director, Engineering (design) reported directly to the EOI Vice President, Engineering, with a dotted organizational line to the ANO Vice President, Operations, who controlled the budget and the scheduling of engineering activities on site. Plant engineering responsibilities were included within the following onsite organizations: training and emergency planning, unit maintenance engineering (Units 1 & 2), system engineering (Units 1 & 2), central maintenance engineering, materials engineering, shift engineering, and modifications.

1.2.1 EOI Central Design Engineering

EOI central design engineering was located in Jackson, Mississippi, in the EOI corporate offices. The directors of engineering from each of the three EOI sites (ANO, Waterford, and Grand Gulf) reported to the EOI Vice President, Engineering. The corporate staff consisted of three groups (approximately 45 personnel). These groups consisted of the engineering analysis, engineering support, and engineering programs.

The team observed that the largest of these groups was the engineering analysis group which provided support for fuel and reload activities. See Attachment 2 for a functional description of central design engineering.

There are presently 20 EOI design engineering peer groups (see Attachment 3) that have been formed. These consisted of a corporate manager, designated as a sponsor, and members from each of the three EOI sites. The purpose of the groups was to exchange information and ideas related to specific technical issues, procedures, and processes. The groups also provided a mechanism to develop and maintain consistency in methodologies utilized, and afforded the opportunities to improve quality and cost effectiveness. The EOI Vice President of Engineering provided overall review and approval of the peer group activities. Some of the specific activities of the peer groups discussed with the team were as follows:

The training peer group was in the process of developing an overview training document that would describe a "Design Engineering Training Program (DETP)" and which would provide guidance for each site as well as corporate. The document would also go into the EOI Design Engineering Administrative Manual. The team observed that at ANO there were several excellent engineering training initiatives and that this document would provide overall direction. The team noted that comparisons of programs by the peer groups at the EOI sites such as erosion/corrosion programs and design basis document programs provided for improvements with the adoption of the better methods and ideas utilized at each site. The use of the same contractor, such as for preparation of plant protective system setpoint calculations, allowed both Waterford and ANO to share information. The special process peer group was, for example, establishing a consolidated welding program for all EOI sites.

It was the overall observation of the team that the EOI peer groups were continuing to provide significant engineering direction for improvement.

1.2.2 ANO Design Engineering

Design engineering was located on site and was composed of five different departments. The five departments were engineering programs, engineering support, nuclear engineering design, electrical/instrumentation and control (E/I&C), and mechanical/civil/structural. The team was informed that there are 219 positions authorized and 214 positions are filled. See Attachment 2 for a functional description of each of these departments.

The team found that long-term planning and major activities were set forth in the ANO 5-year business plan, which was an integral part of the EOI five year strategic plan. There was an integrated site schedule, which was an 18-month plan, and design engineering had a 18-month design engineering plan. The ANO change and review board approved and issued a refueling and non-outage list on a calendar year basis. Engineering support provided a work load job tracking of day-to-day tasks for engineering management. The team concluded that there is effective control of engineering activities. The team also found that the control of the modification process appeared effective in limiting the plant modifications to those that are committed for installation.

The team observed that the licensee was in the process of completing their planned procedure hierarchy for all onsite programs. The principal implementing procedures were observed to be complete. The individual procedures for a program consisted of a program document, station directive, administrative procedure, implementing procedures, and engineering standards. All procedures identified as in process of development were scheduled to be completed by the end of 1993.

The licensee indicated that the general level of experience for the design engineering staff averaged 15 years engineering experience which included 8 years ANO, 2 years other nuclear, and 5 years other engineering. The majority of the engineers were degreed in an engineering or technical discipline.

The team interviewed 24 design engineering supervisors and engineers assigned to the mechanical, civil-structural, E/I&C groups. The interviews were conducted for the purpose of determining how the engineering staff was functioning. The engineers were knowledgeable of their responsibilities and interfaces as well as the availability and use of technical information.

Overall, the team observed that those interviewed expressed a positive assessment of design engineering. The consistency of positive remarks indicated that the design engineering personnel had a favorable opinion of the entire organization and a high degree of professional satisfaction.

The team determined that the staffing levels of each discipline appeared to be consistent with the workload. Between outages, the design engineers worked minimal overtime and during outages the design engineers stated that there was some overtime required. The team noted that approximately one third to one half of the design modification packages were developed by contractors. An ANO design engineer was assigned the contracted modification package and was responsible for reviewing and obtaining the appropriate sign-offs for the package.

The team noted that the design engineers were responsible for their modification packages from conception through design engineering approval and sign-off prior to installation. Once the package was approved by design engineering, it was turned over to the modifications group for installation and acceptance testing. During the development of the modification package, the design engineer called periodic meetings with the system engineer, modification engineer and other affected plant groups to review the progress of the design. The team viewed these meetings as a means to ensure good communications between design engineering and plant groups. During the interviews, the design engineers stated that their primary interfaces were with the system engineers and modification engineers and believed that the communications with these groups were effective.

The design engineers discussed the effects of the engineering department move from Little Rock to Russellville, which occurred a few years ago. The majority of the engineers thought that the move had been beneficial since it helped to improve communications between design engineers and the site groups. In addition, the engineers liked the ease of access to the site.

The training program for the design engineers appeared to be effective. The engineer's supervisor was responsible for determining which courses the engineer was required to take. Training for 10 CFR 50.59 was not mandatory but, in order to sign the safety evaluation, the engineer was required to have had the training. In addition, a systems training course was offered which consisted of classes held one day per week for approximately 20 weeks. Although this course was not mandatory for the design engineers, management encouraged them to attend.

The resources provided to the design engineering groups, such as computers and computer programs, were viewed as having a positive influence on the quality of the work products. Most of the engineers had a computer on their desk with access to data bases which provided information on components, such as drawing numbers, and flow diagram numbers. The engineers stated that they had easy access to vendor manuals, applicable procedures, Technical Specifications and the USAR. Some of the engineers commented that the engineering procedures were cumbersome to use and were being changed too often.

The team concluded that the design engineering department interfaced well with their site contacts, and the morale was good. It appeared that management support was strong. The team considered the staffing levels to be consistent with the workload. Overall, the team viewed ANO as having an effective design engineering program.

1.2.2.1 Engineering Support

The engineering support department had three groups. These consisted of engineering standards, project services, and configuration management. There were 66 budgeted positions.

Engineering standards provided support for development of engineering programs, standards and directives. They relieved the administrative load for program development from the rest of the design engineering organization.

Project services provided the scheduling, planning, and budgeting services for the design engineering organization. The team observed that they were integrated into the design engineering groups. This organization relieved the administrative load of the other organizations in design engineering.

Configuration management was responsible for a number of design document related activities in addition to normal configuration management activities. For example, they had responsibility for the design configuration document (DCD) project development. This activity was scheduled to be completed in 1994. The design configuration information management system was being developed as a part of this activity to provide easy retrieval of design basis information. The team was informed that a paperless (all design information on a personal computer network) design change pilot program was under development.

1.2.2.2 Engineering Programs

Engineering programs were composed of three groups. There were two engineering program groups and a separate fire protection group. There were 19 authorized positions in engineering programs.

One program group handled special processes. The other group included engineering programs such as check valves, ventilation and filter test, and steam generator integrity.

1.2.2.3 Nuclear Engineering Design

Nuclear engineering design consisted of five groups. The majority of personnel were distributed between the two nuclear safety analysis groups and the environmental quality group. There was one person responsible for coordinating fuels oversight and a project manager was assigned for high level waste. There were 19 authorized positions in nuclear engineering design.

The team found that PRA models at ANO have been developed for ANO Units 1 and 2 mostly by the nuclear engineering design staff. The individual plant examination (IPE) for Unit 2 was submitted on August 28, 1992, and the IPE for Unit 1 was scheduled for April 30, 1993. The core damage frequency for Unit 2 was 3.4 E-5 and the preliminary result for Unit 1 was stated to be 4.4 E-5. The licensee indicated that there were no significant vulnerabilities identified. The Level III PRA (IPEEE) was scheduled to be submitted in May 1995. The licensee planned to maintain the PRA as a "living model" to support such activities as the IPEEE, maintenance rule, design changes, and EOPs.

The team also found that accident analysis upper level documents (ULDs) for the DCD project were also being developed in-house by the nuclear engineering design staff. A total of 27 accident analysis ULDs were being developed (11 have already been developed and the remaining 16 are to be completed in 1993). All the other 99 ULDs were being created using a contractor.

The ANO environmental qualification program and the annual safety system functional inspections were also the responsibility of this group.

The team's overall observation was that the diversity and capability of nuclear design engineering is an overall strength for ANO.

1.2.2.4 Electrical/Instrumentation and Control (E/I&C)

E/I&C consisted of five design engineering groups. The electrical and I&C engineering functions were combined within E/I&C. There were 45 authorized positions.

The team found that each group had varied responsibilities. One group had instrumentation and control setpoints, another had electrical systems, another had Regulatory Guide 1.97/Q-list, another supported the MOV effort and another was responsible for computers. The design of the new plant computer, which was recently installed, was performed by E/I&C.

The team was informed that about 10 percent of the electrical modifications were performed by E/I&C, which constituted 25 percent of the manpower usage. Personnel from E/I&C supported such activities as the blackout conceptual design bid, the setpoint program, and the electrical drawing upgrade program. Licensee management indicated that programs to upgrade "obsolescent" plant instrumentation and controls would be a major activity for E/I&C.

1.2.2.5 Mechanical/Civil/Structural (MCS)

MCS consisted of four design engineering groups and a structural analysis organization. Under the structural analysis group were three design engineering groups, a special projects position (presently vacant), and a isometric drawing upgrade group. Mechanical and civil/structural engineering responsibilities were all combined within MCS. There were 67 authorized positions.

The team was informed that MCS was considered to be design capable for all mechanical, civil, and structural modifications. About 50 percent or greater of the modifications were performed within MCS. The MCS group would generally rely on outside contractors for Class I analysis. Design work performed by contractors was assigned to an ANO engineer and was performed in accordance with ANO procedures and format. A number of functional areas were supported by MCS as indicated in Attachment 2.

1.2.3 Plant Engineering

The plant operations had five engineering groups within its organization. These groups were (1) systems, (2) unit maintenance, (3) central maintenance, (4) modifications, and (5) materials.

1.2.3.1 System Engineering

A system engineering group of approximately 30 people was assigned to each unit. These groups were headed by a System Engineering Manager and were further divided into four subgroups. The subgroups were reactor engineering, balance-of-plant, nuclear steam supply system, and E/I&C.

Each of these subgroups had a supervisor or superintendent in charge. Within the two system engineering groups, there were 36 degreed engineers and 9 technical specialists (non-degree or non-engineering degree).

The activities of the system engineers were described in "ANO System Engineering Desk Guide." In general, system engineers monitored the systems assigned to them by walkdowns and measured system performance in various ways. System engineers also supported day-to-day operations of the plants including initiation and disposition of plant engineering action requests, condition reports, drawing revision notices, plant changes, and 50.59 reviews.

System engineers reviewed DCPs and LCPs, and their associated closeout packages, as well as plant incident evaluations (PIEs) and their associated recommendations. The system engineers were responsible for the temporary modification program.

An engineer and, with a few exceptions, a back up engineer were assigned to each of the 82 systems in Unit 1 and 63 systems in Unit 2. System engineering staffing, with the exception of two positions, was complete.

The team found a significant amount of time was spent on training of system engineers (i.e. 15-20 percent). The training was specific to engineering support personnel, and addressed root cause analysis and other subjects such as supervision. Of particular note was the use of system engineers as teachers of classes on their assigned systems.

The team found the concept of system engineering to be still evolving. The desk top guide was in the process of revision. The evolving character of the program had resulted in some activities, such as system action plans and system historical working files, not being fully implemented. One activity, a system annual report, was done and viewed as a strength, but was not defined in the desk top guide. The engineers were not yet certified as defined in the desk top guide. System engineers were involved in walkdowns and monitoring activities that were proactive and were also involved in support of operational activities that were more reactive in character.

The team found the morale to be very high. Office space had been recently remodeled and computers had been obtained for each engineer. This improvement, as well as the "Total Quality Improvement" program and the associated "Quality Action Teams," appeared to have had a significant positive impact on morale.

1.2.3.2 Unit Maintenance Engineering

Approximately 10 unit maintenance engineers were split between the two plant units. They reported to the superintendent for each of the three specific disciplines (mechanical, electrical, and I&C) of each unit. These were degreed engineers with one exception.

The activities of the unit maintenance engineers were described in Procedure 1025.024, "Maintenance Engineering Administration," Revision 2. The unit maintenance engineers supported day-to-day operations by assisting in trouble shooting and repair. Post-maintenance testing was also a responsibility of the unit maintenance engineers.

The team found, like systems engineering, a significant amount of time was spent on training. The team also found morale to be very high.

1.2.3.3 Central Maintenance Engineering

Within the organization, shared by both plants, was a central maintenance engineering group of approximately 50 people. This group was headed by a superintendent of maintenance engineering and was further divided into three engineering subgroups. These subgroups were preventive maintenance, predictive maintenance, and ASME code repair and replacement activities. Each of these subgroups had a supervisor in charge. In central maintenance engineering were eight degreed engineers and eight technical specialists. Also in this group were non-engineering subgroups for computer maintenance and software support.

The activities of central maintenance engineering were described in Procedures 1000.115, "Preventive Maintenance Program," Revision 2 with Procedure Change 1 and 2; 1025.046, "Predictive Maintenance," Revision 0;

1025.043, "Repair Replacement Request Completion Control," Revision 0; and 1025.047, "Repair Replacement Report Requirement," Revision 0.

The central maintenance engineers' responsibilities were to: write preventive maintenance procedures and review preventive maintenance engineering evaluations to effect reliability centered maintenance; perform predictive maintenance such as vibration monitoring, oil analysis, thermography, and non-intrusive check valve inspections on equipment for trending of performance and failures; and support installation of ASME Code Section XI repair and replacement activities by writing welding and nondestructive examination procedures.

The team also found a significant amount of time was spent on training. Like system engineers, maintenance engineers were used to teach preventive maintenance, predictive maintenance, and ASME Code training.

The team also found morale to very high. "Quality Action Teams" were very effective in reducing a backlog of changes to preventive maintenance procedures and improvements in welding controls.

1.2.3.4 Modifications Engineering

In the modifications organization there were two engineering groups, one for each unit. Each of these groups was headed by a superintendent. Within each unit, there were four subgroups of 3 modifications engineers. The organizations were fully staffed with only one open position. At the working level, there were 7 degreed engineers and 15 technical specialists.

Procedures 6000.030, "Control of Installation," Revision 7; 6030.005, "Control of Modification Work," Revision 1; and 6060.001, "Modification Package Closeout," Revision 8, described the activities of the modifications engineers. These activities included supporting design modifications and plant changes by performing evaluation of potential construction problems, installation support, post-modification testing, and package closeout reviews.

The team found not as much time was spent on training of modification engineers in comparison with system engineers.

The team also found morale to be very high. The remodeling of office space and obtaining of computers for each engineer appeared to have had a significant positive impact on morale. Having a computer for each engineer allowed for rapid development of work packages.

1.2.3.5 Materials Engineering

A staff of about 20 persons were part of the materials, purchasing, and contracts organization. This group was divided into a MCS and an E/I&C section, with each headed by a supervisor. At the working level, there were 5 engineers and 6 technical specialists.

The activities of the material engineers were detailed in Procedures 1003.003, "Material Technical Evaluations," Revision 4, Procedure Change 1; and

6050.002, "Dedication of Commercial Grade Items and Services," Revision 3. These engineers supported procurement associated with the repair and replacement activities. The materials engineers established technical and quality requirements for procurement. They were responsible for material technical evaluations and "mini" specifications. The engineers reviewed purchase orders, associated changes and procurement documents. They were also responsible for the dedication of commercial grade items.

The team found this group had been renamed "Procurement Engineering." The activities of this group were not within the scope of this inspection.

1.2.4 Configuration Management

1.2.4.1 Control of Drawing Revisions

The team reviewed the process for controlling ANO drawing changes as defined and described in Procedures 5510.203 "Drawing Control," Revision 0, Procedure Change 2, 5510.100 "Drawing Preparation and Revision," Revision 1, and 5010.020 "Drawing Revision Notices," Revision 1. The drawing control group was responsible for controlling the process to ensure the latest applicable controlled drawings and drawing revision notices (DRNs) were available for use. This group maintained the Design Document Information System as the source for verification of latest revision levels and open DRNs. Drawings and DRNs were distributed in accordance with the Master Drawing Distribution List. Recipients of drawing changes were instructed to remove the previous revision from the controlled file and destroy it or mark it to indicate that it had become obsolete.

The existing DRN process was implemented in April 1992 as an initiative to improve the handling and control of drawings. DRNs were utilized to initiate drawing revisions resulting from plant modifications or other inconsistencies with the as-built configuration of the plant. ANO did not redline or otherwise mark drawings on an interim basis prior to all design changes being incorporated on the revised documents. Upon issuance of a DRN, the affected drawing would be marked to indicate that the outstanding DRN existed.

Upon review of unincorporated DRNs, the team discovered several DRNs for which drawings had not been revised well after the procedural limit of 7 days (requirement of Procedure 5010.020) had passed. These DRNs were classified as Category "A", which indicated that they were "critical documents used in day-to-day plant operations." Several less critical Category "B" DRNs were also found to be overdue. All of the overdue Category "A" DRNs were incorporated prior to the team exit. The team acknowledged that the delinquent DRNs were not safety significant in nature and that the proposed procedure revision should prevent recurrence. ANO had identified the issue of timeliness of incorporation during previous self-initiated quality action team meetings and had initiated a revision to the affected procedures, but the revisions had not yet been implemented. The procedure revisions would extend the time limits for DRN incorporation to a more manageable level, and modify the approval process to eliminate redundant sign-offs. As a result of satisfying the criteria in the NRC enforcement policy for discretion, the failure to follow the procedure has been identified as a noncited violation.

The team inspected the controlled drawings that provided the control room operators with the necessary information to assure the plant maintains safe operation. The team sampled several drawings in the control rooms for both ANO-1 and ANO-2 and found them all to coincide with the latest controlled revisions. Those drawings with pending DRNs were properly marked to reference the DRN number. The team concluded that control room drawings were adequately controlled and the recently implemented DRN process, with the proposed improvements noted above, appeared effective to control the drawing revision process.

1.2.4.2 Control of Vendor Technical Information

The team reviewed the program for ensuring the accuracy of vendor technical documentation as described in Procedure 5510.203 "Vendor Technical Manual Review & Update," Revision 0. The engineering data bases section of configuration management was responsible for controlling ANO technical manuals and maintained the master copies. Additional controlled copies were available in other local libraries. The technical manuals for systems or large components consisted of individual technical documents for smaller components. The computerized technical manual system was maintained to provide inquirers the latest available vendor information for safety-related and other components installed at ANO.

The team verified that ANO had contacted several safety-related vendors at least once annually to assure that it had received the latest applicable technical and maintenance information. In one case reviewed, the vendor indicated that its technical documents had been revised, and ANO had initiated the process to revise its respective technical manuals. ANO utilized the Technical Manual Update/Change Request Form 5510.203A to assure manuals were evaluated and updated as necessary based on the change information provided. Revision instruction packages were prepared and distributed with instructions for updating all controlled copies of the applicable technical manuals.

The team identified a concern that technical manuals were not being updated in a timely manner after related technical documents were revised. Therefore, the potential existed for personnel to reference certain technical manuals which did not reflect the latest vendor information. This problem did not appear to be of substantial safety significance because the individual technical documents, as well as the technical manual system, would reflect the proper revision if referenced directly and not through the system technical manuals. The team viewed ANO's program for updating vendor manuals as very effective with the exception of the concern noted above.

### 1.2.5 Design Bases Program

ANO's design bases program was documented in Procedure 5010.007 "Preparation, Review, Revision and Approval of ULD Documents," Revision 0. The DCD project manager from design engineering was responsible for coordinating the development and control of the ULDs. The purpose of these documents was to provide a condensed source for design bases and design input information related to pertinent ANO systems, structures, and topical areas. Engineering Standard GES-26 "ULD Writers Guide," Revision 0, provided standard format and style guidance for use in preparation of ULDs and identified applicable sources of design information.

System review teams were established, with representatives from each applicable expertise, to produce system review reports as described in Engineering Standard GES-27 "System Review Process," Revision 0. The purpose of this review was to assure a correct and consistent set of system design documentation that completely demonstrated the safety related functions of the system. A final interdisciplinary review of the system review reports was performed by the design configuration review group (DCRG) in accordance with Engineering Standard GES-28 "DCRG Review and EPT Function," Revision 0. DCRG membership included the chairman (a representative from configuration management), design engineers from each of the disciplines (nuclear engineering design, E/I&C, and mechanical/civil/structural), and additional members as determined necessary by the chairman, such as operations, maintenance, quality assurance, and others. The DCRG was further responsible to evaluate and categorize ULD discrepancies based on safety significance, regulatory concern, and cost/benefit analysis.

Design discrepancies identified during the various activities of the DCD project were documented on the Index of Discrepancies Form 5530.002A in accordance with Procedure 5530.002, "Identification and Tracking of DCD Discrepancies," Revision 1. The Discrepancy Evaluation and Resolution Form 5530.002B was utilized by the responsible individual to document the evaluation and determination of potential adverse effects. If the discrepancy was determined to have a potential adverse effect, the responsible individual would initiate a DCD Discrepancy Report (DCDDR) Form 5530.002C and forward it to the designated DCD evaluator. The DCD evaluator would assign the DCDDR a tracking number and enter it into the DCD discrepancy tracking system. If any doubt existed regarding plant safety, a condition report would be initiated within 5-working days, and resolved in accordance with Procedure 1000.104, "Condition Reporting and Corrective Actions."

The maintenance of the ULDs after issuance was ensured by requiring a ULD document review block be checked on the Design Basis Document Checklist Form 6010.001G as part of the modification package review. For design document changes, which do not constitute physical changes to the plant, a similar configuration checklist was used per Procedure 5010.004, "Design Document Updates," Revision 0, to assure all documentation changes required an evaluation of ULD applicability. The team noted and discussed with the licensee that effects on probabilistic risk assessment were not being considered when making documentation changes.

The team concluded that the use of ULDs was well defined and adequate measures had been implemented to maintain the documents current to accurately reflect plant modifications.

### 1.2.6 Audits and Assessments

The team found that the ANO quality assurance organization performed audits every 2 years as required by the Technical Specifications with emphasis on performance based surveillances during the interim period between audits. The last quality assurance audit of engineering was performed between July 30 and November 24, 1992. The conclusion of this audit was that an effective engineering program existed at ANO. There were two quality assurance findings (requiring response), three recommendations (two requiring response), and two observations (no response required). The team also noted that there were eight surveillances performed during 1992 of engineering activities.

The team found that ANO had performed safety system functional inspections annually since 1989. The performance of safety system functional inspections is the responsibility of nuclear engineering design.

ANO performed an annual self assessment of their performance which is patterned, in part, after the NRC systematic assessment of licensee performance criteria. Each manager, which included 13 different departments, provided a self-assessment report which included summaries, trends, weaknesses, strengths, accomplishments, and good practices. The team was informed that presentations made to senior site management totaled about 14 hours. A review of the design engineering 1992 self assessment by the team indicated that a balanced self-critical assessment was performed.

The team considered that the self assessment process was a positive initiative for ANO which continued to demonstrate management's attention to improving performance.

### 1.2.7 Engineering Initiatives

The licensee provided the team with a list of 43 engineering initiatives. A list of these initiatives are provided in Attachment 4. A review by the team indicated that there were varying reasons for the initiatives including past problems, regulatory issues, third party issues and ANO/EOI efforts to increase overall improvement in plant performance. Some of these initiatives are classified as plant "betterment" initiatives (such as DCD program, electrical drawing upgrade and isometric update project). The team observed that while these "betterment" initiatives were manpower intensive, it would appear that they would provide a significant long-term benefit.

The team noted that with regard to the maintenance rule, both units at ANO participated in the verification and validation program sponsored by a third party organization. ANO plans to complete development of a maintenance program to meet 10 CFR 50.65 in 1993 and implement it on a trial basis prior to the required implementation date of July 10, 1996.

### 1.2.8 Control of Industry Information

The team reviewed the following procedures for the receipt, control, and evaluation of regulatory and industry correspondence: Procedure 1062.002, "Nuclear Regulatory Commission Correspondence Control," Revision 6, and Procedure 1010.008, "Industry Events Analysis Program," Revision 4. ANO Procedure 1062.002 provided the method for processing NRC generic letters and bulletins, while ANO Procedure 1010.008 provided the method for processing industry information, including NRC information notices (INs). The team considered the procedures to have sufficient detail to properly handle regulatory and industry correspondence.

The team reviewed a number of the licensee's permanent record files for NRC INs in order to assess the licensee's evaluations and applicable actions. The team reviewed INs 91-13, 91-46, 91-58, 91-85, and 92-64. The licensee stated that IN 92-64 was in process of being evaluated for safety-related and nonsafety-related applicability and a PIE had not been prepared yet. The licensees reviewed IN 91-13, which concerned inadequate verification during testing of the capability of the emergency diesel generators to carry the maximum expected load and the failure of other tests to properly verify the operation of the load shedding logic. The licensee reviewed the appropriate procedures, Technical Specifications, USAR, and design calculations in order to research the problems addressed in the IN. The evaluation was documented in PIE-91-0052-B. It was determined that the concerns about emergency diesel generator ambient air temperature, insufficient compensation for the expected electrical power factor, and inadequate testing of the diesel generator load shedding circuitry were adequately addressed in the existing procedures or followup inspection items from the electrical distribution system functional inspection conducted at ANO. Therefore, no corrective action was required. The team considered the conclusion to be appropriate.

IN 91-46 addressed degradation of emergency diesel generator fuel oil systems caused by inappropriate painting of fuel injection assemblies, fouling of fuel oil strainers or filters, and degradation of fuel oil quality. The evaluation of this information notice was documented in PIE-91-0127-B. The licensee determined that due to an event that occurred on Unit 2 in June of 1986, procedural controls were already in place that specifically addressed the concerns of the IN and no further corrective actions were required. It appeared the licensee had performed a thorough review of the concerns expressed in IN 91-46.

The team reviewed the licensee's response to IN 91-58, which was documented in PIE-91-0214-B. The subject of the IN was to inform licensees of the possibility that offset disc butterfly motor operated valves might not function properly if the orientation of the valve to the direction of flow was incorrect. The evaluation concluded that the possibility existed for offset disc butterfly valves to be installed incorrectly. The evaluation also included recommended corrective actions with action due dates of March, April, and May 1993. The team considered the recommended corrective actions to be appropriate.

IN 91-85 addressed the potential failures of the thermostatic control valves for the diesel generator jacket cooling water system due to failure of the temperature elements in the valves. The licensee determined that the IN was applicable to ANO and evaluated the IN in PIE-91-0166-B. The evaluation included recommended corrective actions to replace the temperature element each refueling outage and a 15 year shelf life for spare parts. The corrective actions are due to be completed in July 1993. The team considered the recommended corrective actions to be appropriate.

The inspectors concluded that the licensee had appropriately documented their review of each of the documents and had sufficiently detailed procedures to properly handle regulatory and industry correspondence.

1.2.9 Conclusions

- The EOI peer groups continue to provide significant overall engineering direction for improvement.
- The new plant computer with interface to the site personnel computers was observed to be providing a number of uses and benefits.
- Staffing levels appeared to be consistent with the workload.
- The training program appeared to be effective. EOI is in the process of issuing a corporate administrative procedure which will provide overall corporate and management direction for design engineering.
- The relocation of design engineering to the site appears to continue to improve the overall interface and working relationship with the plant.
- Employee morale appeared to be excellent which, in part, can be contributed to engineering facilities provided on site.
- The "Total Quality Improvement" program and the associated "Quality Action Teams" appeared to be making a significant improvement in site activities, such as modification, welding, and preventive maintenance.
- The recently implemented DRN process appeared to have improved the revision and control of drawings.
- The program for controlling and updating vendor technical manuals was excellent with the exception of the minor concern noted in this report.
- The design bases program was well defined and adequate measures had been implemented to maintain the program documents current. The training of engineering personnel was scheduled to commence in 1993 and all upper level documents are to be completed in 1994.
- The licensee was found to be properly reviewing and handling regulatory and industry correspondence.

- The engineering "betterment" projects were viewed as positive initiatives with long-term benefits for ANO.

- The diversity and capability of the nuclear engineering design group was observed to be an overall strength for ANO.

- The licensee's self-assessment process with regard to design engineering was viewed as a positive initiative and continues to demonstrate management attention to performance.

- Overall, the engineering organization and program were found to be effective and improving.

- The inspection team identified a noncited violation regarding drawing revision notices not being incorporated within the procedural time limitation. This violation appeared to be an isolated occurrence and the licensee staff took prompt and effective actions to correct the problem and prevent recurrence.

ATTACHMENT 1

# 1 PERSONS CONTACTED

## 1.1 Licensee Personnel

E. Allen, Electrical/Instrumentation and Controls (E/I&C) Engineer
W. Barborek, Modification Engineer
*D. Bauman, Supervisor Configuration Management
*D. Bennett, Supervisor Nuclear Steam Supply System
V. Bhardway, Project Manager, Design Configuration Document (DCD) Project
*V. Bond, E/I&C Design Engineering
S. Bonner, Maintenance Engineer
R. Brumfield, Modification Engineer
S. Capehart, E/I&C Design Engineer
*M. Cooper, Licensing Specialist
B. Day, ANO Unit 1 System Engineer Manager
*B. Eaton, Director, Design Engineering
*R. Edington, Plant Manager Unit 2
*J. Fisicaro, Director, Licensing
B. Fletcher, Supervisor, E/I&C
*M. Goodson, Modifications Supervisor
R. Gordon, Supervisor, Maintenance Engineering
C. Hagerty, Maintenance Engineer
W. Hall, Mechanical/Civil/Structural (MCS) Engineer
*V. Hardwaj, Project Manager, DCD Project
*G. Higgs, Modifications Supervisor
R. Holman, Maintenance Engineer
*D. Howard, Modification Supervisor
*R. Howerton, Manager, Engineering Services
M. Hoyt, Tech Specialist
L. Humphrey, Director, Quality
*W. James, Jr., Modification Supervisor Central Support
*P. Kearney, Modification Supervisor
*R. Kellar, Modifications Supervisor
*M. Keller, Supervisor, Engineer Training
N. Kennedy, Supervisor, E/I&C
*R. King, Supervisor, Licensing
*R. Lane, Manager, MCS Design
M. Ledezma, Supervisor, Maintenance Engineering
D. Lomax, Manager, Engineering Programs
T. Marshall, System Engineer
D. McKenney, Supervisor E/I&C
*J. McWilliams, Manager, Modification
J. Meeker, Modification Engineer
J. Miller, ANO Supervisor, Nuclear Safety Analysis
*D. Mims, Unit 2 System Engineer Manager
R. Mitchell, Maintenance Engineer
*T. Mitchell, Unit 2 System Engineer Supervisor
K. Neamtz, System Engineer
K. Neumeier, E/I&C Engineer
E. Noakes, Tech Specialist

D. Phillips, System Engineer
*T. Reichert, Reactor Engineering Superintendent, Unit 1
*J. Remer, Supervisor, Engineering Data Bases
*E. Rogers, Supervisor, Maintenance Engineering
*R. Sessoms, Modification Superintendent
S. Shuffield, Modification Engineer
T. Sizemore, Modification Engineer
J. Smith, Manager, Engineering Support, Corporate Design Engineering
*F. Titus, Vice President, Engineering
A. Taylor, Supervisor, Maintenance Engineering
*J. Taylor-Brown, Acting Director, Quality
D. Thompson, Maintenance Engineer
*C. Turk, Manager, Nuclear Engineering Design
*C. Tyrone, Superintendent, Procurement Engineering
J. Vandergrift, Plant Manager, Unit 1
*T. Waldo, Modifications Supervisor
*B. Washburn, Manager, Engineering Programs
*R. Weneps, Modifications Supervisor
*A. Wrape III, E/I&C Design Engineer Manager
*J. Yelverton, Vice President, Operations

1.2 NRC Personnel

*L. Smith, Senior Resident Inspector
*S. Campbell, Resident Inspector

In addition to the personnel listed above, the inspectors contacted other personnel during this inspection period.

*Denotes personnel that attended the exit meeting.

## 2 EXIT MEETING

An exit meeting was conducted on February 12, 1993. During this meeting, the team reviewed the scope and findings of the report. The licensee did not identify, as proprietary, any information provided to or reviewed by the inspector.

# Design Engineering

# Functional Organization Charts

# Mechanical Civil Structural Design

## Mechanical

- ☐ Safety Related Pump Curves
- ☐ P/T Calc Program
- ☐ DCD Project Supp
- ☐ SG Program Supp
- ☐ Valve Procurement
- ☐ NSSS / BOP
- ☐ PSV Setpoints
- ☐ Owner's Groups
- ☐ Mechanical Design Authority
- ☐ Corrective Action System Support
- ☐ Design Changes

## Civil

- ☐ Seismic Analyses
- ☐ Blockwall Issues
- ☐ Tendon Surveil.
- ☐ Lifting/Rigging
- ☐ Flooding
- ☐ Facilities
- ☐ Civil Design Authority
- ☐ Design Changes

## Structural

- ☐ Piping Analyses
- ☐ Struc. Analyses
- ☐ Pipe Support Analyses
- ☐ Iso Update Proj
- ☐ SQUG/IPEEE
- ☐ Design Changes

## Valves

- ☐ AOV
- ☐ MOV
- ☐ SOV
- ☐ Design Changes

# Electrical Instrumentation & Controls Design

- ☐ Safe Shutdown Capability Assessments
- ☐ Offsite Pwr System Volt. Evaluations
- ☐ Electrical Drawing Update Project (EDUP)
- ☐ Setpoint Control Program
- ☐ Plant Data Management System ( Cable System )
- ☐ Human Factors Evaluations
- ☐ DCD Project Support
- ☐ Design Changes
- ☐ Electrical System Design Authority
- ☐ Owner's Group Support
- ☐ Corrective Action System Support
- ☐ Station Blackout
- ☐ Reg Guide 1.97 Expertise

# Nuclear Engineering Design

## Safety Analysis

- Nuclear Fuel Management
- PRA
- IPEEE
- Life Extension
- Reload Design Reviews
- Shutdown Risks Evaluations
- Severe Accidents Analyses
- DCD Project Support
- Design Changes
- Safety Analyses Bases
- Radiation Shielding
- Transient Analyses
- Reactor Engr. Staff Support
- Complex Safety Evaluations
- Owners Group
- Source Term Reduction

## High Level Waste

- HLW Storage
- Self Initiated SSFI

## EQ

- EQ Program
- SCEW Evals
- Maint. Support

# Engineering Support

## Engineering Standards

- ☐ Eng. Programs
- ☐ Eng. Standards
- ☐ DE Proc & Work Plans
- ☐ DE Station Directives

## Configuration Management

- ☐ DCD Project
- ☐ Eng. Records
- ☐ Drafting / CAD
- ☐ Graphics Services
- ☐ CDB
- ☐ DCIMS
- ☐ SIMS
- ☐ DRNs
- ☐ NPRDS Data Base
- ☐ Vendor Contacts
- ☐ VTMs
- ☐ Component Level Q List

## Project Services

- ☐ 18-Month Plan
- ☐ Proj Cost Control
- ☐ EAR/PSR
- ☐ Detailed Project Scheduling
- ☐ Engr Estimating
- ☐ Resource Planning
- ☐ Business Planning
- ☐ Budget Support
- ☐ Scheduling Systms
- ☐ Managmt Services

# Engineering Programs

## Fire Prot

- Fire Protection
- Fire Hazards Analysis
- Fire Testing
- Industry Groups
- PEER Group

## Eng. Prog

- ISI
- IST
- Repairs/Repl.
- Welding
- Metallurgical
- Industry Group
- Owners Groups
- PEER Group

## Eng. Prog

- ILRT / LLRT
- Flow Accelerated Corrosion Prev.
- Boric Acid Corrosion Prev.
- Check Valves
- Vent/Fill Tests
- SG Integrity
- Industry Group
- Owners Groups
- PEER Group

# CENTRAL DESIGN ENGINEERING

## NUCLEAR ENGINEERING ANALYSIS

- Nuclear Fuel Management
- Safety Analysis
- Shielding
- Reload Design Reviews
- Reload Analysis
- Fuel Reliability Program
- Fuel Fabrication Contracts
- Nuclear Criticality Analysis
- Core Monitoring Analysis
- Startup Physics Testing
- Plant Simulator Analysis
- Physics Analysis Support of Operations
- Special Nuclear Material Accounting

## ENGINEERING PROGRAMS

- Materials Evaluation
- Welding
- Metallurgical
- Fracture Mechanics
- Peer Groups
- Finite Element Analysis
- Failure Analysis
- ISI/IST/RR Programs
- Erosion/Corrosion
- S/G Eddy Current Testing

## ENGINEERING SUPPORT

- Procurement Engineering
- Peer Groups
- Budget Development
- Configuration Management
- PRA/IPE
- Design Basis Documentation
- Computer Applications

ATTACHMENT 3

<u>Design Engineering Peer Groups</u>

Training
Fire Protection
Piping Stress and Support
Motor and Air Operated Valves
Electrical Design - including Electrical portion of Appendix R, Station Blackout, DC Voltage Drop, RG-1.75
Mechanical Design
Environmental Qualification
Seismic Qualification/Structural
Instrumentation and Control
Security
Design Process
Configuration Management
CAD
Procurement Engineering
Computer Applications
PRA/IPE
Safety Analysis
Special Process (Welding, etc.)
Section XI Programs (ISI, IST, Repair/Replacement)
Business Practice

ATTACHMENT 4

ANO ENGINEERING INITIATIVES

Air Operated Valves
ANO Check Valve
Boric Acid Corrosion
Commercial Grade Item Dedication
Component Data Base
Component Safety Classification
Computer Aided Drafting
Configuration Management
Containment Leak Rate Testing
Design Engineer Peer Groups
Design Configuration Documentation
Electrical Drawing Upgrade
Environmental Qualifications
Equipment Failure Trending
Fire Protection
Flow Accelerated Corrosion
High Level Waste Storage
Human Factors
In Service Testing
In Service Inspection
Isometric Update
Life Extension
Maintenance Rule
Material Engineering Training Program
Materials Technical Evaluations
Motor Operated Valves
NonDestructive Examination
Plant Setpoint Control
Predictive Maintenance
Pressure/Temperature Calculations
Preventive Maintenance Engineering
Probabilistic Risk Assessment
Reliability Centered Maintenance
Repair and Replacement
Shelf Life Evaluation Program
Solenoid Operated Valves
Source Term Reduction
SQUGPEEE
Station Blackout
Steam Generator Integrity Program
Vendor Technical Manuals
Ventilation/Filtration System Testing
Welding