APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-382/94-07

License: NPF-38

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

Facility Name: Waterford Steam Electric Station, Unit 3 (W3)

Inspection At: W3, Killona, Louisiana

Inspection Conducted: March 21-30, 1994

Inspectors: M. Runyan, Reactor Inspector, Engineering Branch
Division of Reactor Safety, Region IV

W. Smith, Senior Resident Inspector
Division of Reactor Projects, Region IV

E. Tomlinson, Senior Reactor Engineer
Office of Nuclear Reactor Regulation

Approved: T. Westerman 4-25-94
T. Westerman, Chief, Engineering Branch — Date
Division of Reactor Safety, Region IV

Inspection Summary

Areas Inspected: Routine, announced inspection of the licensee's program to operate and maintain the emergency diesel generators.

Results:

- Overall, the licensee appeared to be operating, maintaining, and testing the emergency diesel generators in a manner sufficient to ensure good reliability and availability.
- A weakness was observed in the Vendor Equipment Technical Information Program (VETIP). Responses from vendors delineating the existence of technical manual revisions were not being retained for reference purposes (Section 1.1).

- Service bulletins had not been incorporated into the applicable sections of the diesel generator technical manual, nor were they flagged or annotated (Section 1.1).

- The program to evaluate commercial grade procurements and dedications was excellent, though two discrepancies were identified (Section 1.3).

- Adequate consumable and nonconsumable spares were on hand to support the licensee's preventive maintenance (PM) program for diesel generator repairs (Section 1.3).

- Although no specific program existed, the licensee appeared to have adequate control over parts obsolescence (Section 1.3).

- Vendor specifications to clean and lubricate threaded fasteners were not proceduralized or practiced by the licensee. This was identified as a violation (Section 1.4).

- Various indications, examinations, and test results revealed that diesel generator A was in good condition (Section 1.5).

- A cylinder high temperature and imbalance problem was not corrected until nine months after identification. The technical basis for the delayed corrective action was considered acceptable (Section 1.6).

- The licensee's program for trending diesel generator operating parameters was excellent (Section 1.6).

- The licensee had not tested the local diesel generator shutdown feature (Section 1.6).

- Documentation was incomplete in a work authorization concerning a torquing problem with the pedestal mounting bolts. After the exit meeting, the licensee supplied additional information that resolved the technical issue (Section 1.7).

- The licensee had significantly exceeded its goal of 2.5 percent diesel generator unavailability over the past 2 years (Section 1.7).

- The diesel generator system engineer appeared adequately qualified to fulfill the assigned duties and responsibilities (Section 1.9).

- Audit and surveillance findings were found to be primarily administrative, as opposed to technical in nature (Section 1.10).

- The material condition and cleanliness of the diesel generators was generally good, though some deficiencies were identified (Section 1.11).

Summary of Inspection Findings:

- Inspection Followup Item 382/9407-01 was opened (Section 1.1).
- Violation 382/9407-02 was opened (Section 1.4).

Attachment:

- Attachment - Persons Contacted and Exit Meeting

DETAILS

1 MAINTENANCE PROGRAM IMPLEMENTATION (62700)

The inspection consisted of a multi-faceted examination of the licensee's program to operate and maintain the emergency diesel generators.

1.1 Vendor Material

The objective of this portion of the inspection was to verify that the licensee had a process to verify that they had received the latest technical information issued by Cooper Industries (Cooper), pertaining to the emergency diesel generators at Waterford 3. The inspectors reviewed Administrative Procedure UNT-004-035, "Control of Vendor Information," Revision 4, and found that the licensee had a vendor equipment technical information program (VETIP) under the responsibility of the programs engineering supervisor. A key component supplier list was developed, consisting of 26 vendors, including Cooper. At appropriate intervals, usually annually, procurement engineering contacted Cooper and requested information on the latest diesel generator technical manual, bulletin, and drawing changes. The inspectors requested a copy of the most recent request sent to Cooper, and the response. The licensee provided the 1992 request, dated December 3, 1992. The 1993 request had not been sent out as of this inspection. The licensee had no record of the Cooper response; however, after requesting another copy from Cooper, they provided the inspectors with a response dated December 15, 1992. The response listed the six service bulletins issued in 1992. While searching for the Cooper responses, the licensee could not find any responses from any vendors since 1991, when the first inquiries were sent to the key vendors. Condition Report 94-262 was issued on March 24, 1994, identifying this as a weakness in the Waterford 3 VETIP.

The inspectors reviewed 14 of the approximately 50 service bulletins received from Cooper and posted in Technical Manual 457001225, "KSV Turbocharged Diesel Generating Unit." The inspectors found that none of the 14 service bulletins had been incorporated, nor were they annotated, in the applicable sections of the manual. The service bulletin numbers were 581, 612, 616, 631A, 651, 662, 678, 679, 679A, 679C, 684, 685, 689, and 689A. Service Bulletins 689 and 689A (dated June 1985 and March 1986, respectively), however, were referenced in the appropriate section, because Cooper Instruction No. 72846 (dated July 1986), which revised the manual, had been added to the technical manual in January 1987. The instruction referenced Service Bulletins 689 and 689A.

Failure to incorporate, or at least flag the existence of, a service bulletin in the affected section of the manual was considered another weakness in the licensee's VETIP. It placed a burden on engineers, planners, and maintenance personnel to review the inventory of service bulletins whenever the technical manual was used, in the event a change to the section in which they were working might exist. One example was Service Bulletin 616, issued on May 24, 1979, which changed the fuel injector pump delivery valve holddown flange fastener torque from 30-35 foot-pounds to 47-53 foot-pounds. This change was

not visible in Section 8-6 of the manual. When the inspectors requested the licensee to show that the correct torque had been applied whenever these fasteners had been disturbed since 1979, the licensee stated that the pumps were always sent to the vendor for calibration, and it was assumed that the vendor would have used the current information. The inspectors noted, upon reviewing the licensee's 5- and 10-year diesel generator inspection procedure, that shipment of the pumps to the vendor for calibration was specified.

Although no evidence was made available to the inspectors showing that this torque may have been improperly applied, Section 8-6 of the manual provided instructions for the licensee to perform work on the fuel injector pumps, and, as such, the current torque requirements should have been reflected in that section. This weakness in the licensee's VETIP was also identified in Condition Report 94-262. These weaknesses, as related to vendor information, were identified for further inspection followup (Inspection Followup Item 382/9407-01).

A review was also performed to verify that design changes were incorporated into vendor and other applicable documents as appropriate. The inspectors obtained a design change information report to view the population of design changes implemented against the diesel generators, and noted that nine changes were implemented and closed out through February 14, 1994. The inspectors sampled a copy of two design change packages (DCPs) to independently verify that the documents affected by the DCPs were updated. For DCP 3001, "Emergency Diesel Generator Turbocharger Support," the technical manual, which was the only document affected, was appropriately updated in a timely manner. For DCP 3209, 14 drawings, the Final Safety Analysis Report (FSAR), and the system operating procedure were affected. The inspector verified that the FSAR, the operating procedure, and a sampling of 5 drawings were satisfactorily updated. Based on the samples taken, the inspector concluded that the licensee was updating documents affected by design changes on the diesel generators.

1.2 Notifications

The inspectors reviewed the licensee's responses to the following NRC Information Notices (IN) and Cooper-Bessemer 10 CFR Part 21 notifications:

IN 91-046, "Degradation of Emergency Diesel Generator Fuel Oil Delivery Systems";

IN 91-085, "Potential Failures of Thermostatic Control Valves for Diesel Generator Jacket Water Cooling Water";

IN 92-53, "Potential Failure of Emergency Diesel Generator Due to Excessive Rate of Loading";

IN 92-78, "Piston to Cylinder Liner Tin Smearing in Cooper-Bessemer KSV Diesel Generators";

Cooper-Bessemer Part 21, 89-35, "Crosby Relief Valves Model JMBU Type E at Perry Nuclear Station Open When Subjected to Shock";

Cooper-Bessemer Part 21, 93-02, "Fuel Nozzle Tips May Have Insufficient Ligament Thickness and Cracking May Occur"; and

Cooper-Bessemer Part 21, 93-06, "Fuel Pump, Part No. 2-50F-049-001, Has Repeatedly Failed Due to the Presence of Silica and Alumina Particles Which Cause the Galling of the Plunger and Barrel in the Fuel Pump."

The licensee acceptably addressed and documented the technical issues described in the above documents.

1.3 Materials

For the diesel generators of Waterford 3, parts and components are procured from vendors as safety-related to the extent they are available. If parts and components are not available as safety-related from the respective vendors, the licensee performs a commercial grade evaluation (CGE) for the items to be purchased. The CGE is requested by procurement when it is determined that parts and components are not available as safety-related. The CGE is performed by procurement engineering.

A CGE involves (1) a determination of whether or not a specific part or component is, in fact, safety-related, and (2) a determination of the critical design characteristics to be verified if a part or component is determined to be safety-related. In general, a part or component is considered safety-related if the failure to perform its intended function would render the diesel generator inoperable. The critical characteristics to be verified include such things as dimensions, materials, performance characteristics, and calibration requirements. This part of the CGE also includes establishing the methodology for verifying critical characteristics.

The inspectors reviewed a total of 21 CGE packages for diesel generator parts and components, which included both safety-related and non safety-related determinations. The inspectors agreed with the licensee's conclusions pertaining to parts and components determined to be safety-related and non-safety-related. The justifications were clear, concise, and technically sound. This included the determination of critical characteristics and the methodology for establishing the acceptability of these characteristics. Overall, the inspector found this to be an excellent program. The inspectors did, however, have observations on two of the CGE packages reviewed which are discussed below:

- Stock Code 1P100-A57748, Revision 0, dated March 14, 1994

  One critical characteristic of the taper pin covered by this CGE is that the pin be made of steel. The methodology in the CGE for determining that the pin is made of steel is that the pin must be magnetic. The

inspectors found this to be incomplete because there are many materials besides steel that are magnetic. Some other test for determining the pin is made of steel (e.g., hardness testing), to supplement the magnetic test, was brought to the licensee's attention for consideration.

- Stock Code LP107-C65403, Revision 0, dated June 23, 1992

  The part covered by this CGE is a piston ring for an air start control valve. Part of the evaluation indicates the piston ring as being made from fiber, while the critical characteristics portion of the CGE states the piston ring is cast iron. Even though the parent component for this piston ring is safety-related, there was no safety significance to the discrepancy because the acceptance criteria identified the correct material.

The licensee stated that the above observations would be assessed for corrective actions.

The inspectors reviewed the adequacy of the Waterford 3 methodology for managing diesel generator spare parts. In this effort, the inspectors reviewed the actual listing of spare parts on hand and conducted interviews with procurement and engineering personnel regarding diesel generator spare parts.

Spare parts management at Waterford 3 involves mechanical maintenance, procurement, and procurement engineering. Mechanical maintenance is responsible for establishing minimum and maximum spares stocking levels. They are also responsible for establishing reorder levels for spare parts. When reorder levels are reached, procurement personnel are alerted and appropriate actions are implemented to replenish the associated stock. The stocking and reorder levels are based on consumption rates from machinery history and lead time for obtaining spare replacements. In light of this, and considering the review of the list of diesel generator spares on hand, the inspectors concluded that there were adequate consumable spares (e.g., fuel, oil, air filters, or gaskets) on hand to support the licensee's preventive maintenance (PM) program. The inspectors further concluded that there were adequate mechanical and electrical spares available to support the PM program and to support diesel generator repairs, should they be necessary, to minimize diesel generator unavailability and the attendant impact on plant safety.

The licensee is a member of the Cooper Owners Group, which is made up of nuclear utilities having Cooper Bessemer KSV diesel engines. Each utility in the group has an inventory of diesel generator spares that is available to any other utility member, should an emergency need arise.

With regard to parts obsolescence, the inspector could not find any evidence of a program specifically designed to determine whether or not parts or components had become obsolete. This information is usually obtained through

vendor publications. For example, in a letter from Peebles Electric, Inc, dated February 4, 1994, the vendor advised that their 10 CFR 50, Appendix B program was being phased out and that generator spares would not be available as safety related after June 30, 1994. In this case, future purchases of generator spares would have to be made based on an appropriate commercial grade evaluation (CGE). The CGE process at Waterford 3 is well established and the above vendor letter provided adequate time to perform a CGE before safety-related parts had become unavailable or obsolete. For this, and other similar cases, parts obsolescence is readily accommodated within the framework of the existing procurement process. In the case where parts become obsolete without notice from a vendor, the obsolescence would become known when an attempt was made to obtain such parts to replenish stocks on hand. At this time, a suitable substitute would have to be identified using the CGE process discussed above. In the interim, it is likely that there would be adequate parts or components available, since most parts and components have reorder levels that would result in the procurement process being implemented prior to the available stocks being depleted. Based on this, the inspectors concluded that the absence of a specific program to address parts obsolescence is not a problem because obsolescence can be readily accommodated within the framework of the licensee's organizations responsible for procurement and spares management.

1.4 Procedures and Work Instructions

The inspectors reviewed the following sample of procedures and work instructions established for the maintenance and inspection of diesel generators:

- MM-003-015, "18 Month Emergency Diesel Engine Inspection," Revision 9;
- MI-005-202, "Calibration of Pressure Instruments," Revision 5;
- MI-005-204, "Calibration of Temperature Instruments," Revision 6;
- MI-005-490, "EDG Control System Calibration and Maintenance," Revision 0;
- MI-005-203, "Calibration of Differential Pressure Instruments," Revision 7;
- MM-003-040, "En-Spec 1000 Diesel Engine Analyzer," Revision 1;
- MM-006-011, "General Torquing and Detensioning," Revision 5;
- MM-006-001, "Valve Maintenance," Revision 10;
- ME-004-021, "Emergency Diesel Generator," Revision 8;
- CE-002-030, "Maintaining Diesel Fuel Oil," Revision 4;

- WA01114442, "Perform Inspection of EGA Per MM-003-015";
- WA01120387, "Measure Power Cylinder Compression Pressure to Trend Cylinder Power Head and Pistons for Degradation and Ring Wear";
- WA01120375, "Measure and Record Turbocharger Spin-down Time";
- WA01114489, "Cracked Rocker Arm on a Palo Verde Nuclear Plant EDG has Prompted Cooper KSV EDG Owners to Inspect for Rocker Arms with 'JG' in Serial Numbers"; and
- WA01118822, "Temperature Differential Between Lube Oil and Jacket Water Exceeds Vendor Recommendation of 5 to 10 Degrees (Jacket Water Hotter). Replace Internal Element IAW Technical Manual."

In general, all of the procedures implemented the technical requirements of the diesel generator technical manual. In particular, Procedure MM-003-015 was excellent in terms of technical content, scope, and human factoring for the 18-month diesel generator inspection planned for this outage. However, while verifying correct acceptance criteria in the generator cleaning and inspection procedure, ME-004-021, the inspectors noted that the acceptance criterion for proper slip ring brush tension was 3.28 pounds pull with a spring scale. There was no tolerance, and the acceptance criterion was not expressed as either a maximum or a minimum value. Upon questioning the electricians on how they have been able to achieve such a precise value, they responded by stating that they considered it a nominal value, and adjusted the brushes to the increment that was closest. The system engineer contacted the vendor and determined that a tolerance of plus or minus 4 ounces would be acceptable, and the procedure was changed accordingly.

The inspectors also noted that the work instructions appearing in the work authorizations listed above were clear and concise, and were appropriate to the circumstances, given the experience level of the maintenance technicians, their training, and the presence of vendor representatives during the work.

The inspectors performed a review to ensure that the application of fastener torque, when specified, was accomplished in accordance with consistent standards to obtain the intended prestress. The inspectors verified that the general torquing and detensioning procedure, MM-006-011, contained torque values that were based on using an approved thread lubricant and lubricated full surface contact on the nut bearing surface, or bolt head bearing surface. When the inspectors inquired about whether the running torque of nylon insert locking fasteners was considered in the torque values, the maintenance engineer responsible for the procedure stated that in the rare occasion that such fasteners were used, they relied on the vendor technical manual torque values, or handled them on a case basis.

At another nuclear facility, the fuel injection pump hollow mounting studs failed, in part, as a result of improper prestress. The inspectors reviewed

the procedures used for these studs and discussed the actual practices at Waterford 3 with the lead mechanic and the system engineer. The 5-year and 10-year diesel generator inspection procedures, MM-003-041 and MM-003-042, respectively, specified 52 foot-pounds torque, with no special instructions to clean, lubricate, or consider the running torque of the nylon insert locknuts. Torquing Procedure MM-006-011 was only listed as reference material. Cooper Service Bulletin 710, dated May 4, 1987, stated that unless indicated on the assembly drawing, torque values specified were to be achieved using petroleum type lubricants on both the threads and seating surfaces, and recommended Lubriplate 630-AA. The service bulletin also directed the reader to Standard SD-123, which was in the diesel generator technical manual. Standard SD-123 required threads to be clean and free of burrs, and lubricated with Lubriplate 630 series. In addition, the standard required the running torque of fasteners with nylon or deformed thread locking features to be added to the specified torque. None of the procedures used for installing the fuel injector pump mounting fasteners implemented all of the above requirements. In practice, the mounting nuts at Waterford 3 were installed without cleaning the threads, without lubricating with Lubriplate 630-AA, and, using the residual diesel fuel coating on the threads, torqued to the specified 52 foot-pounds. Failure to provide an adequate procedure to properly implement the requirements of the diesel generator technical manual for installation of the fuel injector pumps was identified as a violation (382/9407-02).

In response to the inspectors' concerns over whether the diesel generators could be considered operable with a questionable prestress on the injector pump mounting fasteners, the licensee contacted Cooper for an evaluation. Cooper stated that the installation was acceptable, as long as the fasteners were not cleaned (which they were not), because the residual lubricant and fuel oil would have ensured acceptable prestress. Also, the torque specified by the applicable drawing in the diesel generator manual took into account the additional torque needed to compensate for the locking feature running torque. This position was further supported by the fact that there had been no failures of the injector pump mounting studs on the Waterford 3 diesel generators. The licensee indicated that they plan to properly clean and lubricate the diesel generator fasteners in accordance with the manual in the future. The licensee's actions will be followed up in response to the violation cited above.

1.5 Inspection

It was intended that a significant portion of the licensee's activities associated with the 18-month PM on Diesel Generator A would be observed by the inspectors. However, because of schedule problems, this goal was not attainable, and the number of activities observed was minimal. Nevertheless, the inspectors were able to draw some conclusions regarding the overall condition of Diesel Generator A. These observations and conclusions are detailed below.

- The inspectors reviewed the pressure volume (PV) diagrams produced by the ENSPEC-3000 engine analyzer for Diesel Generator A. Except for some variation in peak firing pressure and indicated mean effective pressure (IMEP), the diagrams were substantially identical, with no irregularities, such as would be caused by a firing problem or some mechanical malfunction. The PV diagrams indicated a very consistent start of injection followed by uniform combustion. In sum, the PV diagrams indicated an engine that was running very well with good balance and work distribution between cylinders. There were no negative indications.

- Data from the ENSPEC-1000 engine analyzer provided additional confirmation that Diesel Generator A had good cylinder-to-cylinder balance and was in good operating condition.

- The inspectors walked up and down both banks of Diesel Generator A when it was operating at full load and listened to each cylinder. This is somewhat subjective, but is recognized in the industry as having value. There were no discernable differences in the sound between cylinders, nor were there any metallic sounds emanating from any of the cylinders. This indicated an engine that was running well with good balance and having no obvious mechanical malfunctions. These observations were supported by analyzer data.

- The inspectors examined the camshaft lobes and the camshaft drive gears at the rear of the engine. There were no signs of distress from either wear or misalignment. In fact, except for some oil discoloration on some cam lobes, all components looked new.

- No signs of oil sludge, such as would be present in an engine that had not received proper lubricating oil maintenance, were observed. To the contrary, the engine areas that were available for inspection were clean.

- The inspectors examined the liner and top of the piston of one cylinder on which the cylinder head had been removed. This was the cylinder that had previously experienced severe scoring that resulted in a crankcase explosion. The piston and liner had been replaced, but the cylinder had been opened up again to replace a leaking "O" ring. The condition of the piston and liner were "like new" with no discernable signs of distress. This is to be expected, however, since the cylinder had seen only approximately 150 hours of operation. Therefore, no significant conclusions regarding overall engine condition could be drawn from the condition of this particular cylinder.

- The only maintenance activity observed involved inspection of camshafts and gearing and checking of valve timing. These tasks were being performed by contract (Cooper) personnel. There was a procedure on

hand, and specific personnel associated with the ongoing work were observed signing various portions in the procedure.

- During the full load maintenance run, the kilowatt (kW) meter for Diesel Generator A was observed to fluctuate as much as 100 kW, or more. There was no apparent explanation for this small instability, but governor sensitivity was suspected. The fuel racks demonstrated a similar lack of total stability. This condition was not considered to be of concern regarding diesel generator operability, but it was probably the cause of observed variations in IMEP and peak firing pressures from cylinder to cylinder. The inspectors had seen evidence of a similar condition at other nuclear plants.

- The inspectors observed contract employees using cable runs near or on the base of Diesel Generator A as "steps" when ascending to higher locations on the EDG. The inspectors made this concern known to licensee personnel. The inspectors advised the licensee to protect these cables, or provide conspicuous marking cautioning against stepping on the cables. Pre-work training of contract employees was also identified for licensee consideration.

1.6 Testing

The licensee's program for trending diesel generator operating parameters was excellent. Procedure PE-001-009 was established and maintained to accomplish diesel generator data trending and evaluations, including 17 key performance indicators to detect early signs of wear, fouling of heat transfer surfaces, loss of fluid pressure, unreliability, or loss of capacity. In addition, the program included diesel generator reliability monitoring in accordance with Regulatory Guide 1.155 and NUMARC 87-00 guidelines. The system engineer was required to issue a quarterly performance report to keep key management apprised of the performance of the diesel generators.

The inspectors reviewed copies of the quarterly reports for the year 1993, and noted in the combined first and second quarter 1993 report dated July 28, 1993, that the system engineer had identified an adverse trend of Cylinder 4R peak pressures and temperatures, on Diesel Generator B. He reported the cylinder exhaust temperature to be in excess of 1000 degrees F by about 20 degrees and a maximum cylinder pressure imbalance of 260 pounds per square inch (psi) versus Cooper's recommended maximum of 160 psi. He initiated Condition Identification 286655 so that work could be scheduled to balance the diesel generator. The work was scheduled for September 27, 1993, but other plant priorities precluded it. The same condition was identified in the November 5, 1993, third quarter report. The work was rescheduled for January 17, 1994, but the vendor could not provide service on that date, so it was rescheduled for the present refueling outage. The inspectors questioned the prudency of allowing such delays in taking corrective action. The licensee responded by stating that they had consulted with the vendor and

concluded that the delays would not cause measurable degradation and would not affect the operability of the diesel generator.

The inspectors noted that the system engineer also trended monthly lubricating oil chemistry reports to note any changes in oil contaminants, wear metals, or additives. The system engineer was the recipient and a reviewer of the fuel oil test results. The inspectors reviewed the diesel generator fuel oil testing program implemented by Procedure CE-002-030, against Technical Specifications 4.8.1.1.2.c.1-3, and found that the ASTM methodology and acceptance criteria were consistent and in accordance with NRC regulations.

The inspectors obtained a computer printout of all the work and testing scheduled for this diesel generator outage, and noted that the appropriate instrument calibrations were to be accomplished.

The inspectors verified that the licensee had a program to monitor vibration trends associated with the diesel generators as part of a plant-wide program established in Procedure UNT-005-023, "Plant Vibration Program," Revision 0. The inspectors reviewed this procedure and examined recent diesel generator vibration data. Much of the vibration data was too erratic to be useful as a long-term trending tool. The inspectors discussed with the licensee possible reasons for the inconsistency of the vibration data. It appeared to the inspectors that several factors could be responsible including the method of holding the vibration probe and the establishment of repeatable running conditions prior to each surveillance. The licensee stated that a recent change had been made to restrict the data collection to five individuals. The inspectors encouraged the licensee to continue to review the process in order to attain more repeatable results.

The inspectors noted that the licensee had not tested the local shutdown feature, but instead always stopped the diesel generators from the control room. The inspectors observed that the local test, though not required, could provide assurance that local shutdown control was available. This capability could be important to industrial safety and to the response time to a diesel generator malfunction.

1.7 Maintenance History

The inspectors reviewed a maintenance history report that summarized each corrective and preventive maintenance activity associated with the emergency diesel generators since the plant was licensed. This review indicated that the licensee has kept a complete record of the diesel engine maintenance in a document that is easily reviewable for adverse trends.

During the review of the itemized maintenance activities, the inspectors noted that a bolting problem had occurred on Diesel Generator A. On September 12, 1991, the licensee discovered that the fuel pump pedestal mounting bolt on Cylinder 3L had sheared off and a similar bolt on Cylinder 2L was loose. Work Authorization (WA) 01083749 was issued. During restoration following bolt replacement, the WA stated that only three of the four bolts could be torqued

to the specified 50 to 60 foot-pounds. The upper right bolt could not be torqued apparently because of interference problems. It was uncertain whether this bolt was finger tight or had been torqued with a smaller uncalibrated wrench. The engineering justification for torquing only three of the four bolts was as follows:

> "-Fastener integrity is maintained. Overtorquing is not possible because of the fasteners orientation and the fastener's strength is maintained without torquing.
> -The design of the initial preload of this fastener is to provide gasket compression to prevent lubrication oil leakage. This can be post maintenance tested."

The inspectors challenged the technical adequacy of this evaluation because it appeared that the bolts in question had a structural function that depended on application of the specified torque. This issue also included the concern that other bolt installations may have been similarly dispositioned.

The inspectors reviewed WA 01085637, which documented the inspection of the similar bolts on Diesel Generator B in response to the discrepancies discovered on the A Diesel Generator. No problems were identified, but, despite the fact that this work was accomplished only approximately one month after the work on Diesel Generator A, no discussion of inability to torque the upper right bolts was mentioned in the package. This difference was unexpected because of the identical orientation of the two diesel generators.

The issues discussed above were identified as an unresolved item via a telephone call between Messrs. T. Westerman of Region IV and L. Laughlin of Entergy on March 29, 1994. The licensee provided additional information in a facsimile submittal on March 30, 1993. This material included a stress calculation, an interoffice memorandum, and a failure analysis report of the failed bolt. These documents demonstrated that the structural requirements of the pedestal mounting bolts were considered at the time of the event, and that shortly after the problem occurred, a torque wrench was fabricated to torque the previously inaccessible bolts. The licensee stated that WA 01085637 would be updated to reference these documents. The inspectors concluded that, although the original WA was poorly documented, the licensee had satisfactorily resolved the bolt torquing issue.

The inspectors reviewed the licensee's records of diesel generator reliability based on valid and nonvalid starts as defined by Regulatory Guide 1.108 and NUMARC 87-00. The licensee's records indicated that there have not been any valid failures to start in the last 50 demands and 3 valid failures in the last 100 starts. Since the trigger value of 5 valid failures in 100 starts had not been exceeded, diesel generator surveillance testing was being conducted at the nominal monthly frequency. The inspectors did not identify any concerns related to the manner in which the licensee had classified diesel generator failures as valid or nonvalid.

The inspectors reviewed the licensee's analysis of diesel generator unavailability over the past 2 years. According to these records, the licensee had significantly exceeded its goal of 2.5 percent unavailability by maintaining unavailability during this period at less than 1.0 percent. This record indicated that the licensee had promptly corrected diesel generator problems during this period and had provided a good preventive maintenance program to minimize the necessity for corrective maintenance.

The inspectors reviewed a sample of closed condition reports (CRs) and special reports (SRs) involving problems associated with the diesel generators. The following CRs were reviewed: 91-143, 93-022, 93-071, 93-207, and 93-273. The following SRs were reviewed: 91-002-03 and 92-003. In each case, the problem statement, root cause evaluation, and corrective action appeared appropriate to the circumstances.

1.8 Qualification of Personnel

The inspectors reviewed the qualifications and training of the maintenance personnel utilized for the inspection, maintenance, and testing of the diesel generators. Each of the qualified mechanics had received basic mechanics, followed by 40 hours of advanced mechanics related to the diesel generators, with emphasis on the 18-month inspection requirements. After satisfactory completion of job performance measures (practical on-the-job training), the mechanics took an oral evaluation. Nine mechanics, two planners, and the system engineer attended a 40-hour course at the Cooper facility in Mount Vernon, Ohio, which emphasized engine inspection techniques. The electricians designated to work on the generator part of the diesel generator went through a similar process for electricians, except they did not receive vendor training, because none was available.

Typically, there have been Cooper representatives assisting the plant staff on the diesel generator outage inspections, which has lessened the need for extensive training specific to the diesel generators.

1.9 System Engineer

The inspectors reviewed Administrative Procedure UNT-007-054, "Systems Engineering Program," Revision 1, which delineated the duties and responsibilities of system engineers in general. The procedure clearly stated what was expected of the system engineer, and the system engineer assigned to the diesel generators was knowledgeable of those expectations, based on an interview with the inspectors. The system engineer was also responsible for the supporting systems such as diesel fuel oil and lubricating oil. Another engineer was assigned the generator portion of the diesel generator. The diesel generator system engineer was assigned as a backup for the auxiliary boiler and associated systems including auxiliary steam, and also was a backup engineer for the condensate polishers. This did not appear to be an excessive burden.

The system engineer was a graduate mechanical engineer, and received plant systems training, which included about 3 days on the diesel generators. He attended Woodward Governor school, Cooper pre-outage experience school with the maintenance personnel above, and attended Cooper owners group meetings three times per year.

The diesel generator system engineer appeared adequately qualified to fulfill the assigned duties and responsibilities.

1.10 Quality Assurance Audits and Surveillances

The inspectors reviewed the following quality assurance audits (designated SA-) and surveillances (designated QS-):

- SA-93-001.1, "Technical Specifications," October 1 to December 1, 1993;
- SA-93-023.1, "Procedure Revision Process; and Instructions, Procedures and Drawings," June 29 to August 31, 1993;
- SA-93-028.1, "Station Blackout," September 1 to October 5, 1993;
- SA-93-034.1, "Operations," February 16 to April 7, 1993;
- QS-93-023, "QA Surveillance of I&C Calibration of EDG Jacket Water Temperature Switch," May 15, 1993;
- QS-92-045, "QA Surveillance of Emergency Diesel Generator "A" Disassembly During Refuel 5," September 21-22, 1992;
- QS-92-063, "Emergency Diesel Generator "A" Inspection and Reassembly During Refuel 5," September 23-24, 1992;
- QS-93-022, "Emergency Diesel Generator and Subgroup Relay Operability Test-Train B," April 12-13, 1993; and
- QS-94-012, "Rework Emergency Diesel Generator Air Compressor 1B," February 1, 1994;

The review of these documents indicated that the licensee had a quality program in place to monitor diesel generator activities. The inspectors observed that many of the findings identified in the audits and surveillances tended to be administrative, as opposed to technical in nature. No other findings or observations were identified.

1.11 Walkdown

On March 21, 1994, the inspectors walked down Diesel Generators A and B to assess the general condition of the equipment and to observe housekeeping practices.

The outage for Diesel Generator B had been completed, but the equipment had not yet been restored to an operable status. The overall material condition of the diesel generator was good. The room and the diesel generator skid were adequately clean and preserved, but there was evidence of several oil leaks in the area below the turbocharger and fuel oil filters, as evidenced by the absorbent material placed under them.

Diesel Generator A was operable and in a standby status. The diesel generator had not received its scheduled maintenance as yet, and the licensee had the machine in a "protected status" because only one diesel generator was operable. The inspectors noted a significant air leak on a filter associated with Dryer A1 for the starting air system. Although this equipment was designated nonsafety-related, the leak had been blowing air since March 16, when the system engineer initiated a condition identification report to have the leak repaired. The compressor appeared to be working almost continuously to keep up with the leak, as evidenced by the prolonged running cycle and the motor temperature. The inspectors questioned the system engineer about the prudency of allowing the leak to go unrepaired or unisolated for several days. The system engineer explained that he was hesitant to express concern about a timely repair while the other diesel generator was out of service. Additionally, plans were to take Diesel Generator A out for inspection and repair within a week. Within a few hours, the system engineer informed the inspectors that the repair was going to be implemented and, by the next day, the repair was completed. The inspectors also found an oil can capable of holding about 3 gallons of oil that had been left unsecured on the cylinder head walkway, with a small quantity of oil in the bottom of the can. The shift supervisor was informed, and he took action to have the can removed from the room.

1.12 Followup of Outstanding Diesel Generator Issues

The inspectors reviewed and discussed with the licensee the following open condition reports affecting the diesel generators: CR-93-189, CR-94-145, CR 94-146, CR-94-150, and CR-94-173. The licensee appeared to be satisfactorily pursuing resolution of the identified discrepancies.

ATTACHMENT

1 PERSONS CONTACTED

1.1 Licensee Personnel

*R. Azzarello, Director, Design Engineering
*B. Baptist, Superintendent, Material Management
*R. Burski, Director, Nuclear Safety
A. Cilluffa, Maintenance Engineering Supervisor
*M. Ferri, Director, Plant Modifications and Construction
*D. Gallodoro, Supervisor, Procurement Engineering
*T. Gaudet, Operations Licensing Supervisor
C. Goodman, Supervisor, Scheduling and Cost
*P. Gropp, System Engineering Supervisor
*J. Hoffpauir, Maintenance Superintendent
*J. Houghtaling, Technical Services Manager
M. Huskey, Supervisor, Programs Engineering
*J. Johnston, Senior Staff Engineer
*M. Knebel, System Engineer
*L. Laughlin, Licensing Manager
*R. LeBlanc, Licensing Supervisor
*A. Lockhart, Quality Assurance Manager
J. Mahoney, Supervisor, Design Engineering Support and Databases
D. Marpe, Mechanical Maintenance Supervisor
W. McDonald, Electrical Technical Specialist
*J. O'Hern, Training Manager
*D. Packer, General Manager, Plant Operations
G. Payne, Mechanical Technical Specialist
G. Pickett, Senior Plant Mechanic, DG Lead Mechanic
C. Thomas, Licensing Engineer
*D. Vinci, Operations Superintendent

1.2 NRC Personnel

*E. Ford, Senior Resident Inspector

The inspectors also contacted other licensee personnel during the inspection.

* Denotes those attending the exit meeting

2 EXIT MEETING

An exit meeting was conducted on March 25, 1994. During this meeting, the inspectors reviewed the scope and findings of the report. The licensee did not express a position on the inspection findings documented in this report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.