

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report No. 50-458/92-19

Operating License No. NPF-47

Licensee: Gulf States Utilities
P.O. Box 220
St. Francisville, Louisiana 70775

Facility Name: River Bend Station (RBS)

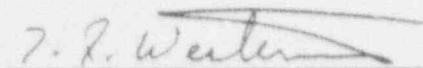
Inspection At: RBS, St. Francisville, Louisiana

Inspection Conducted: June 8-12, 1992

Inspectors: C. Paulk, Reactor Inspector, Plant Systems Section
Division of Reactor Safety

K. Weaver, Engineering Aide, Project Section A
Division of Reactor Projects

Approved:



T. F. Westerman, Chief, Plant Systems Section
Division of Reactor Safety

6-24-92
Date

Inspection Summary

Inspection Conducted June 8-12, 1992 (Report 50-458/92-19)

Areas Inspected: Routine, announced inspection of licensee actions to correct weaknesses identified during the electrical distribution system functional inspection (EDSFI) in 1990. This included corrective actions for an identified violation. Additionally, the inspectors reviewed actions taken in response to licensee event reports (LERs).

Results: Within the areas inspected, no violations or deviations were identified.

The inspectors reviewed licensee actions taken in response to Violation 458/90200-01, Inspection Followup Item 458/90200-05, and the weaknesses identified in NRC Inspection Report 50-458/90-200. The inspectors concluded that the licensee had taken actions where appropriate in response to these items.

The inspectors also reviewed licensee actions taken in response to LERs. The inspectors found that the licensee had appropriately identified root causes and corrective actions. Additionally, the inspectors found the corrective actions to be appropriate in response to the issues.

DETAILS

1. PERSONS CONTACTED

GSU PERSONNEL

- *D. Andrews, Director, Quality Assurance
- *R. Barnes, Supervisor, Codes and Standards
- *J. Booker, Manager, Nuclear Industry Relations
- *J. Cook, Technical Assistant, Licensing
- *T. Crouse, Manager, Administration
- *M. Crowell, Nuclear Training Coordinator
- *R. Eastlick, Radwaste Supervisor
- B. Fichtenkort, Senior Mechanical Engineer
- *R. Finkenaur, Senior Electrical Engineer
- *T. Fredieu, Supervisor, Maintenance Services
- *K. Garner, Licensing Engineer
- A. Garrett, Senior Electrical Engineer
- *J. Hamilton, Director, Design Engineering
- *T. Knight, Student Engineer
- *D. Lorfing, Supervisor, Nuclear Licensing
- *J. McQuirter, Licensing Engineer
- *J. Mead, Supervisor, Electrical and Special Projects
- *W. Odell, Manager, Oversight
- *S. Radebaugh, Assistant Plant Manager, Maintenance
- *K. Suhrke, General Manager, Engineering and Administration
- *C. Walling, Supervisor, Mechanical Process System
- *L. Woods, Shift Supervisor

NRC PERSONNEL

- *R. Baer, Senior Health Physicist
- E. Ford, Senior Resident Inspector, RBS
- *D. Loveless, Resident Inspector, RBS
- *T. McKernon, Reactor Inspector
- *W. McNeill, Reactor Inspector

*Indicates persons present at the June 12, 1992, exit interview.

The inspectors also contacted other licensee personnel during the inspection.

2. ELECTRICAL DISTRIBUTION SYSTEM FUNCTIONAL INSPECTION (EDSFI)
(TI 2515/111)

An NRC team conducted an EDSFI in accordance with Temporary Instruction (TI) 2515/107 at RBS from May 21 through June 22, 1990. The team had several findings regarding inadequate design reviews for certain conditions of operations and postulated failures of certain EDS equipment. These findings were classified as one violation with nine examples. Additionally, one followup item was identified as well as five weaknesses.

The NRC issued TI 2515/111, "Electrical Distribution System Followup Inspection," dated May 31, 1991. This TI was issued because past EDSFIs had identified significant findings that resulted in licensee corrective actions, such as calculational upgrades and hardware modifications, which required expenditure of major resources. The specific issues identified during the EDSFI are discussed below.

2.1 (Closed) Violation 458/90200-01: Failure to Verify or Check the Adequacy of Design

During the EDSFI, the team identified nine examples of a violation for failure to verify or check the adequacy of design. The Notice of Violation was issued August 17, 1990. The licensee acknowledged the violation by letter dated September 18, 1990.

In addition to addressing the specific issues identified in the Notice of Violation, the licensee also stated that actions would be taken to alert personnel to the issues to prevent recurrence. These actions were to revise the procedures governing the performance of engineering calculations and audit performance. The inspectors reviewed Engineering Department Procedure AA-20, Revision 7, "Engineering Calculations," and Operations Quality Procedure and Instruction QAI-2.1, Revision 7, "Audit Performance, Reporting and Followup." The inspectors concluded that these revised procedures, as well as the actions described below, were sufficient to prevent recurrence of the identified violator.

2.1.1 Emergency Diesel Generator (EDG) Loading Calculations

During the EDSFI, the team noted that the loading calculations for EDGs 1 and 2 did not contain analyses for the sequencing of loads over the full time band of the load sequence timers. As a result, the team concluded that a potential for overloading the EDGs existed.

In the September 18 1990 letter, the licensee stated that the failure to address the load sequencer timer tolerance was not significant. The licensee concluded that a special test performed during start-up demonstrated the capability of the EDGs to accept design loads.

The inspectors reviewed Calculation E-192, Revision 4A, "Standby Diesel Generator Loading Calculation," and Engineering Evaluation and Assistance Request (EEAR) 90-R0089, dated February 27, 1991. The EEAR evaluated the possible loading on the three EDGs, assuming the worst case for the sequencer timers. The inspectors observed that for the worst-case scenario, the EDGs would not exceed any of the published ratings. The inspectors also noted that the calculation supported this observation.

The inspectors concluded, on the basis of their review of Calculation E-192, Revision 4A, and EEAR 90-R0089, that the licensee had addressed this concern of the EDSFI team.

2.1.2 Failure of Division 3 Bus During Fast Transfer

During the EDSFI, the team found that the licensee had not analyzed postulated failures of the Division 3 bus loads during a fast transfer of the Division 3 bus to the preferred offsite power source.

In the September 18, 1990 letter, the licensee stated that several options would be considered to address this concern. The inspectors reviewed Condition Report (CR) 90-0554 that addressed the potential damage to the high pressure core spray (HPCS) pump or motor, or to Standby Service Water (SSW) Pump SWP*P2C should they be operating at the time of a fast transfer from Normal Station Service Transformer "C" to either Preferred Transformer "C" or "D." The licensee stated that the Division 3 bus was aligned to a preferred transformer and would remain in this configuration so that a fast transfer could not occur.

The licensee also performed a probabilistic risk assessment to analyze the risk of failure of the HPCS and SWP*P2C SSW pumps due to fast transfer. The analysis evaluated two cases: 1) fast transfer if both preferred transformers fail, and 2) fast transfer if only one preferred transformer fails and it is assumed that the HPCS bus is the aligned to the normal transformer. The licensee concluded that for Case 1, the risk of damage to the HPCS and SWP*P2C pumps would be 2.3×10^{-11} per hour, and for case 2, the risk was 1.1×10^{-10} per hour. The licensee stated that these risks were insignificant compared to the risk of failure to run for a motor-driven pump (approximately 3.0×10^{-9} per hour).

The inspectors concluded, on the basis of their review of the CR and the results of the probabilistic risk assessment, that the licensee had addressed this concern of the EDSFI team.

2.1.3 Short Circuit Protection During EDG Testing

During the EDSFI, the team found that the calculations for the short circuit contribution of the Divisions 1, 2, and 3 EDGs did not consider the short circuit contribution during the independent testing of the EDGs in parallel with the unit generator. This was a concern because the short circuit ratings of the Class 1E switchgear could have been exceeded under such conditions.

In the September 18, 1990 letter, the licensee stated that RBS was operating in a configuration that would preclude this mode of operation and would continue to do so until revised calculations were performed to address this concern. The licensee also stated that several options for resolution were being considered.

The inspectors reviewed Calculation E-131, Revision 1, Addendum B, "Station Service Short Circuit Analysis," which was performed to address this concern. The licensee initiated CR 90-0555 to evaluate and revise station operating procedures to provide restrictions on the parallel operation of the EDGs. The inspectors reviewed the applicable station operating procedures and found that

steps to impose operational restrictions on the bus loading when testing was performed were included.

The inspectors concluded, on the basis of their review of the calculation and the operating procedures, that the licensee had addressed this concern of the EDSFI team.

2.1.4 Sizing of Grounding Resistors

During the EDSFI, the team found that the calculation for the neutral grounding resistor for EDGs 1 and 2 did not address the requirements of current capability and related thermal considerations. Additionally, the licensee could not provide a calculation for the sizing of the EDG 3 grounding resistor.

In the September 18, 1990 letter, the licensee stated that the analysis for the current and thermal capabilities for EDGs 1 and 2 would be added to the calculation. The licensee also stated that it would either obtain the calculation for the EDG grounding resistor from its vendor or perform the calculation themselves.

The inspectors reviewed Calculation E-130, Revision 3, "Grounding Resistor Calculation." The inspectors found that the licensee had analyzed the current and thermal capabilities of the EDG 1 and 2 grounding resistors. Additionally, the licensee had performed the calculation for the sizing of the EDG 3 grounding resistor.

The inspectors concluded, on the basis of the review of the calculation, that the licensee had addressed this concern of the EDSFI team.

2.1.5 Failure of Division 3 Because of Undetected Ground

During the EDSFI, the team identified the possible loss of Division 3 bus loads when transferring to the offsite grid with a ground fault present after a loss of offsite power. This was possible because the grounding resistor on EDG 3 was sized such that a continuous ground fault would be limited to a very low value, thus having no impact on the Division 3 operation. Should the bus be transferred to the offsite grid with a ground fault present, the available fault current could rise to approximately 1000 amps and adversely affect Division 3 operation.

The inspectors reviewed Temporary Change Notice 90-0552 to Procedure ARP-601-16, Revision 5, "P601-16 Alarm Response HPCS System Ground." The inspectors noted that Operator Action 4 stated to "NOT attempt to transfer" from the EDG to offsite power until the ground was cleared.

The inspectors concluded, on the basis of the procedure change, that the licensee had addressed this concern of the EDSFI team.

2.1.6 Short Circuit Calculations for Control Circuits

During the EDSFI, the team noted that the licensee had not performed a short circuit analysis for the protection and coordination of control circuits. The team was concerned that, based on inadequate documentation, numerous control circuits critical for the safe shutdown of the plant may not have been adequately protected against postulated faults.

In the September 18, 1990 letter, the licensee stated that an analysis of the acceptability of the circuit protection would be performed. The inspectors reviewed Calculation E-200, Revision 1A, "125 VDC Overcurrent Protection." The inspectors concluded, on the basis of Calculation E-200, Revision 1A, that the licensee had addressed this concern of the EDSFI team by demonstrating the acceptability of the circuit protection.

2.1.7 Potential Failure of the SSW System

During the EDSFI, the team identified a concern that a loss of the SSW system may occur during a loss of coolant accident with offsite power available. Under this postulated accident condition, if one of the three normal service water pumps remained energized, the low pressure start signal to the SSW pumps may not have actuated.

The licensee evaluated this concern and determined that the SSW pumps would have started. At this time, however, this is no longer a concern because of the installation of the closed loop service water system. This system has three 100 percent pumps, therefore, any one pump could supply all service water loads, including the decay heat removal heat exchangers. The inspectors found that the SSW system will only be necessary when there is a loss of offsite power coincident with a loss of coolant accident.

The inspectors concluded, based on the licensee's evaluation and the installation of the closed loop service water cooling system, that the licensee has addressed the concern of the EDSFI team.

2.1.8 EDG Lock Out Feature

During the previous EDSFI, the team noted that the EDG airstart system had a lock out feature that prevented automatic starts when the air pressure dropped to 150 psig. The plant Technical Specifications (TSs) allowed the pressure in the starting air accumulators to drop to 160 psig. The EDSFI team was concerned that the lock out feature could prevent the automatic start of the EDG if, during the first start attempt at 160 psig, the air accumulator pressure dropped to 150 psig (start cycles typically required 10 to 20 psig).

Although the licensee verified the TS value of 160 psig was met using Procedure OSP-0012, Revision 9, "Diesel Generator Building Rounds, Daily Report Log," a "Diesel Generator EGS*EGIA System Trouble" alarm would activate in the control room at 210 psig. The operators would follow the guidance of Alarm Response Procedure ARP-EGS*PNL3A/D10, "Start Air Receiver Press Low," to

maintain air pressure above the alarm setting (greater than 225 psig). Additionally, the licensee lowered the lock out feature to 140 psig to provide added assurance that adequate air pressure would be available to manually start the EDG if it failed to start upon receipt of an emergency signal. The licensee verified that the EDGs would start at 140 psig as part of their corrective action.

The inspectors concluded, on the basis of their review of CR 90-0558 and Procedure OSP-0012, that the licensee had addressed this concern of the EDSFI team.

2.1.) Excessive Hydraulic Stress on Piping During Simultaneous Starting of Two SSW Pumps

During the EDSFI, the team noted that under loss of coolant accident conditions the SSW pumps (ISWP-P2A and ISWP-P2C) could start simultaneously when powered by the Division 1 and 3 safety buses. The team was concerned that the licensee had not analyzed for the two pumps starting simultaneously and producing significantly higher hydraulic stress in the Division 1 SSW mechanical piping.

The licensee performed an analysis for the event to establish the transient forces on the piping. The analysis was contained in the licensee's Calculations 228.800-PX-562, Revision 2; 228.800-PX-567, Revision 2; and G13.18.10.2*058, Revision 0. The result of the licensee's analysis was that the piping and pipe supports would be stressed to less than their allowable stress levels, therefore no changes to the piping or supports were required.

The inspectors concluded, on the basis of their review of EEAR 90-0086 and Calculations 228.800-PX-562, 228.800-PX-567, and G13.18.10.2*058, that the licensee had addressed this concern of the EDSFI team.

2.2 (Closed) Inspection Followup Item 458/90200-05: Transformer Surge Protection

During the EDSFI, the team noted that the design calculations did not consider protection of the 4160/480 VAC load center transformers against lightning and system surges.

The licensee issued EEAR 90-R0087 to address the adequacy of the surge protection for the 4160/480 VAC load center transformers. The inspectors reviewed this EEAR and noted that the licensee utilized the guidance of IEEE Standard 141-1986, "IEEE Recommended Practice for Electric Power Distribution for Industrial Plants." The licensee concluded that the subject transformers were adequately protected as installed. The inspectors concurred with the licensee's conclusion.

2.3 EDSFI Weaknesses

2.3.1 Transformer Magnetizing Inrush Current

During the EDSFI, the team noted that the EDG loading calculations did not take into account the transformer magnetizing inrush current that would occur if a 4160/480 VAC load center transformer was deenergized and reenergized under full load conditions. The licensee agreed to perform an additional analysis to address the inrush current.

The inspectors reviewed Calculation E-192, Revision 4, "Standby Diesel Generator Loading Calculation," and found that the licensee had addressed the inrush current. The inspectors concurred with the licensee's conclusion that this issue was not significant.

2.3.2 Calculation and Drawing Errors

During the EDSFI, the team found errors on design drawings and in the calculation for the starting voltage at the air compressor motor. The licensee agreed to correct the affected drawings and calculations.

The inspectors reviewed Design Change Notices DCN 90-D0119 and 90-D0129 and found that the drawing errors were corrected as a result. The inspectors also reviewed Calculation E-205, Revision 1, Addendum A, "1LSV*C3A Starting Voltage Calculation," and found that the error had also been corrected.

2.3.3 125 VDC Cable Sizing

During the EDSFI, the team found that the calculation for sizing direct current cables did not consider the short circuit contribution from the battery chargers. The licensee performed the requisite calculations and agreed to add an appendix to the calculation.

The inspectors reviewed Calculation E-181, Revision 1, Addendum F, "DC Cable Size Verification." The inspectors found that the subject calculation had been revised as the licensee stated.

2.3.4 Battery Room Temperature

During the EDSFI, the team noted that the station battery capacity was calculated on the basis of an electrolyte temperature of 60°F. However, no alarms were in place to monitor for low temperatures in the battery rooms. The EDSFI team was concerned that if the battery room temperature dropped below 60°F as a result of non-IE heater failure or because of extremely cold weather, the battery capacity would be in an unanalyzed condition and the control room operators would not be alerted to the problem. The team also found that appropriate administrative controls were not in place to ensure battery room temperatures remained above 60°F.

The licensee subsequent to the EDSFI established administrative controls. The inspectors reviewed Station Operating Procedures STP-000-0001, Revision 11C, "Daily Operating Logs"; STP-000-0004, Revision 5C, "Daily Cold Shutdown Logs"; and, STP-000-0005, Revision 5, "Daily Refueling Logs" and verified that the licensee had implemented appropriate administrative controls to monitor battery room temperatures.

The inspectors concluded, on the basis of their review of the station operating procedures, that the licensee had addressed this concern of the EDSFI team.

2.3.5 Inconsistent Wording in Updated Safety Analysis Report (USAR)

During the EDSFI, the team noted that the USAR stated that all SSW pumps started automatically during the initial phase of recovery from a LOCA. However, the team found that the SSW pumps are automatically initiated only on low differential pressure in either the normal service water or the reactor plant closed cooling water system. Therefore, the statement in the USAR was incorrect unless the LOCA occurred simultaneously with a loss of offsite power or other events resulting in low differential pressures. The team was concerned that the above USAR statement was misleading.

The licensee has revised the USAR per License Change Notice No. 9.2-157 to clarify the statement on the initiation of the SSW pumps following a LOCA.

The inspectors concluded, on the basis of their review of the LCN, that the licensee had addressed the concern of the EDSFI team.

3. ON-SITE REVIEW OF LERs (92700)

3.1 (Closed) LER 90-048: Equipment Qualification Lifetimes of Two Hydrogen Igniters Located in the Upper Drywell Apparently Exceeded

On December 24, 1990, the licensee determined that two hydrogen igniters and associated cables had exceeded their qualified life. The licensee attributed this to the actual ambient temperature being higher than that used to calculate the qualified life.

The licensee replaced six hydrogen igniters and associated cables during the third refueling outage. The replacement equipment was qualified through the fourth cycle. The licensee calculated the qualified lives of the equipment inside the drywell using the actual temperatures. The inspectors reviewed Calculation G13.18.15.1*68, Revision 0, "Qualified Life of EQ Equipment at the Top of the Drywell." The inspectors found that the qualified life of the affected equipment was as follows:

Hydrogen Igniters IHCS*IGN28A & 30B - 3.09 years;

Hydrogen Igniters IHCS*IGN28B, 29A & B, & 30A - 12.24 years;

Cables for IHCS*IGN28A, B, 29B, & 30B - 1.51 years; and

Cables for IHCS*IGN29A & 30A - 28.06 years.

The inspectors verified that each part of the above equipment was being replaced in accordance with its qualified life. The licensee has scheduled the replacement of the four cables with a qualified life of 1.51 years every refueling outage. This replacement will continue until the licensee can justify a longer life. The two igniters with a qualified life of 3.01 years were scheduled for replacement every other refueling outage.

The inspectors also verified that the licensee had evaluated other equipment that may have been affected by the higher temperatures. The inspectors did not identify any concerns with the licensee conclusions.

The inspectors concluded, on the basis of their reviews, that the licensee had taken appropriate actions to address this concern.

3.2 (Closed) LER 91-001: Use of Improper Control Room Filter Initiation Signal Due to Discrepancies Between Logic Diagrams

On February 12, 1991, the licensee discovered a discrepancy between the logic diagrams and elementary diagrams for the initiation signal of the main control room ventilation charcoal filtration system. The licensee found that the initiation signal was at reactor water Level 1 instead of reactor water Level 2.

The licensee reviewed the two sets of diagrams and identified additional inconsistencies; however, the only safety significant item was the main control room ventilation charcoal filtration system initiation. The licensee corrected the identified discrepancies.

The inspectors reviewed the licensee's actions and concluded that appropriate actions had been taken.

3.3 (Closed) LER 91-007: Indeterminate Equipment Qualification Status of Resistance Temperature Detectors in the Standby Gas Treatment System

On April 4, 1991, the licensee determined that the qualification status of Pyco resistance temperature detectors (RTDs) installed in the standby gas treatment system was indeterminate. The licensee found that the installation configuration of the RTDs was not qualified and had existed since initial installation. This occurred because the licensee's architect engineer changed the configuration improperly during the design of the plant. The licensee has evaluated other installation configurations designed by the architect engineer and found the same configuration existed for the fuel building filter trains.

The licensee replaced the subject RTDs with qualified RTDs. The inspectors verified the RTDs had been replaced and found that the replacement RTDs had a qualified life of 2 years. The inspectors verified that the replacement of

the RTDs was addressed in the maintenance program. The inspectors also found that the licensee was in the process of obtaining RTDs with a 40-year life to replace those with the 2-year life.

The inspectors concluded, on the basis of their reviews, that the licensee had properly evaluated this condition and had taken appropriate actions.

3.4 (Closed) LER 91-014: ESF Actuations Due to Relay Malfunctions Having the Same Failure Mode

On July 19 and 23, 1991, engineered safety feature actuations occurred because of relay malfunctions. The licensee determined that the failure mode of the relays was the same.

The cause of the failures was found to be small deposits of material released from the varnish coating applied to the relay coil. This finding led to the issuance of a report in accordance with 10 CFR 50, Part 21. The manufacturer of the relays modified the materials used in the construction of the relays to correct this condition.

The licensee was replacing the relays with the newer models during the refueling outage that was underway. The inspectors concluded that the licensee's actions were appropriate.

3.5 (Closed) LER 91-022: Indeterminate Equipment Qualification Status of RTD in the Fuel Building Filter Trains

On December 23, 1991, the licensee discovered that fuel was moved in the fuel building between June 4-8, 1991, with unqualified RTDs in the fuel building filter trains. Subsequent to the fuel movement, the RTDs were replaced. The licensee identified this condition during preparation for a complete core offload during Refueling Outage 4.

The licensee had made an operability determination that concluded the RTDs would perform properly in a normal environment. The RTDs may not have performed properly if subjected to high humidity because of possible moisture intrusion. This was not properly communicated to the appropriate personnel and resulted in insufficient administrative controls.

The accident scenario that the RTDs would be required to mitigate was a fuel handling accident with subsequent boiling of the spent fuel pool water. At the time of fuel movement with the RTDs in an unqualified configuration, there was not enough heat load in the spent fuel pool to cause boiling. The licensee concluded that there was no safety significance for this incident as it occurred.

The licensee provided training to the Engineering Analysis Group on the importance of communication when performing operability analysis.

The inspectors concluded that the licensee's actions upon discovery of this event were appropriate.

4. SUMMARY OF TRACKING ITEMS ADDRESSED IN THIS REPORT

The following is a synopsis of the status of open items activity in this inspection report.

LER 90-048 was closed.
VIC 90200-01 was closed.
IFI 90200-05 was closed.
LER 91-001 was closed.
LER 91-007 was closed.
LER 91-014 was closed.
LER 91-022 was closed.

5. EXIT MEETING

An exit meeting was held with those persons indicated in paragraph 1 on June 12, 1992. The scope and findings of the inspection were summarized as detailed in this report. The licensee did not identify as proprietary any of the materials provided to, or reviewed by, the inspectors during this inspection.