APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-458/89-36 Operating License: NPF-47

Docket: 50-458

Licensee: Gulf States Utilities Company (GSU)
P.O. Box 220
St. Francisville, Louisiana 70775

Facility Name: River Bend Station (RBS)

Inspection At: RBS, St. Francisville, Louisiana

Inspection Conducted: September 1-30, 1989

Inspectors: E. J. Ford, Senior Resident Inspector
W. B Jones, Resident Inspector

Approved: _____ 10/31/89
G. L. Constable, Chief, Project Section C Date
Division of Reactor Projects

Inspection Summary

Inspection Conducted September 1-30, 1989 (Report 50-458/89-36)

Areas Inspected: Routine, unannounced inspection of followup of events, operations safety verification, maintenance observation, surveillance test observations, and potential 10 CFR Part 21 followup.

Results: Within the areas inspected, no violations or deviations were identified. The reactor operators demonstrated the ability to deal with an unexpected reactor scram (Scram 89-03) in a manner which minimized the transient imposed on the plant. After appropriate corrective actions and evaluations, the operators returned the plant to power in a professional manner. They properly utilized and complied with various operating and administrative procedures during the scram and subsequent startup. Maintenance and surveillance activities were conducted in accordance with the controlling documents.

DETAILS

1. Persons Contacted

*J. E. Booker, Manager, Oversight
*J. L. Burton, Supervisor, Independent Safety Engineering Group
E. M. Cargill, Supervisor, Radiation Programs
*J. W. Cook, Lead Environmental Analyst, Nuclear Licensing
*T. C. Crouse, Manager, Quality Assurance (QA)
*W. L. Curran, Cajun Site Representative
*J. C. Deddens, Senior Vice President, River Bend Nuclear Group
D. R. Derbonne, Assistant Plant Manager, Maintenance
*L. A. England, Director, Nuclear Licensing
*R. W. Frayer, Director, Projects
R. G. Finkenaur, Electrical Engineer
A. O. Fredieu, Supervisor, Operations
*P. E. Freehill, Outage Manager
*P. D. Graham, Executive Assistant to the Senior Vice President
*J. R. Hamilton, Director, Design Engineering
G. K. Henry, Director, Quality Assurance Operations
D. E. Jernigan, Instrumentation and Control Supervisor
*G. R. Kimmell, Director, Quality Services
J. W. Leavines, Director, Field Engineering
*W. H. Odell, Manager, Administration
*T. F. Plunkett, Plant Manager
*J. P. Schippert, Assistant Plant Manager, Operations
R. J. Vachon, Senior Compliance Analyst
J. Venable, Assistant Operations Supervisor
*D. H. Wells, Senior Licensing Analyst
*R. G. West, Supervisor, General Maintenance

The NRC also interviewed additional licensee personnel during the inspection period.

*Denotes those persons that attended the exit interview conducted on October 13, 1989.

2. Plant Status

After reducing power in August to work on the "B" feedwater pump, the unit achieved full power on August 25, 1989, and remained at full power throughout the month of September. However, on September 30, 1989, during the performance of surveillance testing, the reactor scrammed from 80 percent power for reasons unknown at that time. Licensee investigations later disclosed that a faulty test switch had caused the scram. Subsequent to cause analysis, corrective maintenance actions, and retesting, the unit was returned to full power.

3. Followup of Events (93702)

During this inspection period, the inspectors reviewed licensee condition reports (CRs) and 10 CFR 50.72 reports and held discussions with various plant personnel to ascertain the sequence, cause, and corrective actions taken for plant events. Discussion of a selected event is given below:

a. Reactor Trip

On September 30, 1989, at approximately 3:40 a.m., the reactor tripped. The cause was not immediately obvious. At the time, the licensee was conducting a Technical Specification (TS) required monthly functional surveillance test of the main steam isolation valves (MSIVs). (See paragraph 6 for a discussion of the surveillance.)

MSIV closure is sensed by the reactor protection system (RPS). Parameters such as steam flow and pressure, steam line radiation, steam tunnel temperature, and reactor water level are monitored and abnormal readings will cause the MSIVs to close, thus isolating the main steam lines. The reactor is then scrammed by the RPS in anticipation of the pressure and flux transients resulting from this isolation.

(1) RPS System Overview of Normal Operation

The RPS is composed of two independent trip systems. A trip from either channel (Channel A or C) in Trip System A and a trip from either channel (Channel B or D) in Trip System B will generate a reactor scram signal. This is referred to as a "one out of two twice" logic. A trip of only one of the trip systems is referred to as a half-scram and will not generate a reactor scram signal.

Each trip channel consists of a series pathway of normally closed relay contacts which remain closed as long as the corresponding monitored plant parameter stays within specified limits. (Typical parameters monitored are: turbine valve position, drywell and reactor pressure, reactor vessel levels, and MSIV position.)

If a parameter exceeds a preset value, its contact opens causing relays to deenergize, thus putting that channel in a tripped state.

During a scram, both RPS trip systems de-energize, which de-energizes both solenoids on the scram pilot valves to cause the scram.

(2) Main Steam Line (MSL) Isolation

The MSL isolation scram setpoint (any three lines with valves less than 90 percent full open) is selected to give the earliest positive indication of MSIV closure and still allow functional testing of MSL isolation trip channels with one steam line isolated. A normal test of MSIV closure will cause a half scram. To produce the half scram, it is necessary to position a test switch to the test position. By doing so, one of two paralleled contacts are opened.

The test switch is a key switch which requires a key to be inserted in order to move the switch from the NORMAL position. Normally, the key cannot be removed unless the switch is in the NORMAL position.

The effect of the switch in TEST is that for either test position it opens one side of the parallel branch circuit. When in NORMAL, the circuit is undisturbed.

The test switch associated with Channel D was defective. The operator, at the conclusion of the previous months testing, had rotated and extracted the key (indicating that the switch had been returned to NORMAL); however, the test contacts were still open.

GE design philosophy does not provide for an annunciator for this switch because it does not bypass a safety function. Thus, there was no indication available to the operators to warn them of this condition. Further, the relay for trip Channel D remained energized and no alarm was annunciated because a half scram is not present.

When testing commenced on September 30, 1989, a "portion" of a half scram was in place but was not detectable by visual observation or annunciators. As testing (by actually stroking the MSIVs) progressed, the expected half scrams were being produced properly until the "C" MSL was exercised. Channel C deenergized its relay and produced a half scram and a side branch for the D channel was also open (due to the defective switch) and both trip systems were in a condition to generate the full reactor scram.

b. Reactor Trip Followup

The inspector reviewed CR 89-1070 associated with the scram and the written statements of the engineers, operators, technicians, and craft foreman on duty at the time. The inspector verified that the 10 CFR 50.72 (nonemergency) 4-hour notification was made within the required time (the call was made at 6:59 a.m.). The inspector also

reviewed the following documents associated with the scram package (Scram 89-03) for proper implementation:

- General Operating Procedure GOP-0003, "Scram Recovery" which includes:
  - Posttrip Review Checklist
  - Scram Report
  - Performance Package

A review of the control room log for the 6 p.m. to 6 a.m. shift disclosed that the plant had started a routine power reduction to 80 percent power shortly after midnight and achieved this power level a little more than 2 hours later. The 3:40 a.m. entry states: "Reactor scrammed while performing STP-051-0201, Step 7.5.4." Various entries subsequent to this indicate the appropriate use of the abnormal operating procedures.

The inspector reviewed drawings, the surveillance test in use (see paragraph 6), and discussed the involved circuitry with technicians and engineers to independently verify the licensee's evaluation of the cause of the trip.

No violations or deviations were identified.

4. Operational Safety Verification (71707)

The inspectors observed operational activities throughout the inspection period and closely monitored operational events. Control room conduct and activities were generally observed to be well controlled. Proper control room staffing was maintained and access to the control room was well controlled. Selected shift turnover meetings were observed, and it was found that detailed information concerning plant status was being covered. Several control board walkdowns were conducted by the inspectors. In all cases, the responsible operators were cognizant as to why an alarm was lit and the reason for each plant configuration. Operational conditions and events identified through discussions with the reactor operators and review of the shift turnover logs were identified in the main control room log. Inoperable equipment, identified during the main control board walkdowns, were identified by the applicable limiting condition for operation (LCO).

The inspectors conducted several tours of accessible areas of the facility during this inspection period. General housekeeping practices were found to be adequate. Walkdowns of the A and B residual heat removal systems were conducted. Major flow path valves were verified to be in the required standby position. The associated power supply for each major flow path valve and pump was observed to be available. No conditions were

noted which would indicate the associated system would not perform its intended safety function.

The inspectors verified that selected activities of the licensee's radiological program were implemented in conformance with facility policies, procedures, and regulatory requirements. Radiation and/or contaminated areas were properly posted and controlled. Radiation work permits contained appropriate information to ensure that work could be performed in a safe and controlled manner. Radiation monitors were properly utilized to check for contamination. During plant tours, the inspectors frequently checked calibration stickers on various radiological monitoring equipment and physically verified that selected very high radiation area access control doors were locked and closed.

The inspectors observed security personnel perform their duties of personnel and package search. Vehicles were properly authorized and controlled or escorted within the protected area (PA). Personnel access was observed to be controlled in accordance with established procedures. The inspectors conducted site tours to ensure compensatory posts were properly implemented as required because of equipment failure or degradation. The PA barrier had adequate illumination and the isolation zones were free of transient materials. The licensee operated the plant in a safe, controlled manner during this inspection period.

No violations or deviations were identified.

5. Maintenance Observation (62703)

On September 16, 1989, the licensee had indications of a loss of the "B" train instrument bus panel (SCM*PNL1B). Further investigation by the operators disclosed evidence of combustion products in the vicinity of the power line conditioner (SCM*XRC14B1) which feeds the panel. This is a 480 Vac to 120 Vac transformer. The power line conditioner (PLC) was severely damaged and maintenance activities were initiated to replace the item.

The inspector observed the extent of the damage to the PLC and reviewed the associated documentation. Licensee personnel initiated CR 89-1037, dated September 16, 1989. The licensee's initial failure analysis was based on visual observation and determined that a failure of the main 480 Vac step down transformer had occurred. The licensee's interim disposition recommended:

- that power supply cables between the PLC and the instrument bus panel be meggered,
- that the alternate power supply to the "B" RPS bus (transformer 1RPS*XRC10B1 - this is not required for the "B" RPS by the RBS TS) be utilized,

- that the neutral ground strap in the instrument panel be repaired (MWO-R056460 was used for this), and

- that power be restored to the panel one load at a time verifying proper restoration of systems.

The above recommendations were implemented by the licensee utilizing Modification Request PMR 89-25. The inspector reviewed the following documentation associated with this maintenance action:

- Modification Request PMR 89-25

- Design Review Checklist

- Civil/Structural Evaluation Checklist

- Departmental Work Responsibility Checklists

- Equipment Qualification Impact Review Checklist

- Fire Protection Review Checklist

- Equipment Qualification Impact Summary (EQIS)

- Security Considerations Checklist

- Design Input Guidelines

- Initial Safety and Environmental Evaluation

- Unreviewed Safety Question Determination

The inspector noted that the Departmental Work Responsibility Checklist for operations required changes to Abnormal Operating Procedure (AOP) AOP-0042, Surveillance Test Procedure (STP) STP-302-0102, and System Operating Procedures (SOP) SOP-0079 and SOP-0048. A review of STP-302-0102, "Power Distribution System Operating Check," disclosed that Temporary Change Notices (TCN) 89-1067 and 89-1068, incorporating PMR 89-025, had been properly accomplished. AOP-0042, "Loss of Instrument Bus," was changed by TCN 89-1063. SOP-0048, "120 VAC System (Sys 304)," and SOP-0079, "Reactor Protection System (Sys 508)" were changed by TCN 89-1065 and TCN 89-1064.

On September 13, 1989, the inspector observed maintenance activities associated with the Division I emergency diesel generator room ventilation fan Breaker 1EJS*SWG1A-ACB12. The control building operator identified that the charging motor was continuously running. Maintenance Work Order Request (MWOR) R132605 was initiated to restore the breaker to an operable condition. After removing the breaker to the electrical shop, a spare breaker was assigned to 1EJS*SWG1A-ACB12 and the ventilation fan started to prove operability. The Division I diesel generator was subsequently declared operable.

During troubleshooting of the breaker, the electrician identified that a pin in the breaker subassembly had sheared off. The pin normally allows rotation of the cam which makes and breaks the contact for the charging motor. At of the end of the inspection period, the engineering staff was evaluating the reason for the pin failure. GE, the supplier of this 480 volt AKR-30 breaker, has been notified of the pin failure and will be onsite to help evaluate the reason for the pin shearing. This evaluation will be documented in CR 89-1021.

No violations or deviations were identified.

6. Surveillance Test Observation (61726)

During this inspection period, the inspector reviewed the technical adequacy of Surveillance Procedure STP-051-0201, "RPS-Main Steamline Isolation Valve - closure Monthly Chfunct." This procedure was being performed when the reactor unexpectedly scrammed. The inspector also observed surveillance activities associated with the low pressure coolant injection (LPCI) system. Each of these inspection activities is discussed below:

° STP-051-0201

Surveillance Test Procedures STP-204-0202, and STP-204-0203, "LPCI "B" and "C" Discharge Piping Fill and Valve Lineup Verification"

Surveillance Test Procedures STP-204-0202, and STP-204-0203, "LPCI "B" and "C" Discharge Piping Fill and Valve Lineup Verification," were performed on September 27, 1989, with the reactor at full power. These monthly surveillance procedures satisfy the requirements of Technical Specification (TS) Section 4.5.1.a.1 as it applies to the LPCI system and to 4.5.2.1 as it relates to 4.5.1.a.1 by verifying that the system piping, from the pump discharge valves to the system isolation valves, is filled with water by venting at the high point vents.

It also demonstrates system operability by verifying that each valve (manual, power operated, or automatic) in the LPCI system flow path that is not locked, sealed, or otherwise secured in position, is in its correct position. This satisfies TS 4.5.1.a.2 as it applies to the LPCI system. This also satisfies TS 4.5.2.1 as it relates to TS 4.5.1.a.2.

This procedure also demonstrates system operability by verifying that each valve (manual, power operated, or automatic) in the suppression pool cooling mode of the RHR system flow path that is not locked, sealed, or otherwise secured in position, is in its correct position. This will satisfy TS 4.6.3.3.a.

The inspector accompanied an operator performing portions of the procedures in the plant and in the control room. It was noted that procedural precautions and limitations were followed, all

prerequisites satisfied, and appropriate authorization had been granted. The inspector observed the operator exercise appropriate caution when venting the LPCI lines due to the presence of potential sources of airborne radiation and contamination. All vented fluid was correctly contained and routed to nearby floor drains. The test results were determined to be acceptable and were properly reviewed by the control operating foreman.

- STP-051-0201

  "RPS-Main Steamline Isolation Valve-Closure Monthly ChFunct"

  On September 30, 1989, when the reactor scrammed, the licensee was performing STP-051-0201, "RPS-Main Steamline Isolation Valve-Closure Monthly ChFunct," to satisfy TS Section 4.3.1.1, Table 4.3.1.1-1.6. This TS requires each RPS instrumentation channel be demonstrated operable by the performance of a channel functional test. Specifically, when in Operational Condition 1, it requires a monthly channel functional test of the MSIV closure function.

  To perform a technical review of the procedure, the inspector consulted various electrical drawings on the RPS and MSIV logic and wiring, test switch contacts, and effects on the circuitry when placed in the test position. The inspector discussed the surveillance with the individual who performed the test and independently did a detailed "walk-down" of the test to assure its workability. The inspector consulted with individuals in the maintenance and operations department with expertise on the systems while reviewing the drawings. The inspector also independently reviewed other technical references (e.g. the Licensed Operator Training Manual) to assure a proper understanding and evaluation of the procedure. It was concluded that the procedure was adequate to perform the surveillance test without inducing an unwanted condition.

Additional information on the reactor scram is contained in paragraph 3.

No violations or deviations were identified.

7. Potential Part 21 Followup - Maximum Combined Flow Limiter Setting and Postulated Control Valve Failure

The licensee was informed by General Electric (GE) of a potentially reportable condition involving the slow closure of a main turbine control valve due to a postulated failure. A closure time less than 2.3 seconds will cause the reactor to scram on high neutron flux. A closure time of greater than 2.3 seconds would cause a reactor scram due to high reactor pressure (a slow increase in flux accompanies the pressure increase). This closure time (greater than 2.3 seconds) may cause the minimum critical power ratio (MCPR) safety limit to be exceeded if the maximum combined flow limiter (MCFL) is set for less than 113 percent of rated steam flow. Because of the delay in reactor scram until the high pressure

setpoint is reached, a large increase in the surface heat flux of the fuel rods would cause a change in the critical power ratio (CPR).

The purpose of the MCFL is to prevent an excessive total steam flow (i.e., the combined flow to the turbine through the control valves and to the condenser through the condenser bypass valves) in the event of a failure in the pressure regulating circuitry (i.e., an upscale failure of the demand signal due to the pressure regulator failing open). This is an important feature on plants with a large bypass (steam dump to condenser) capacity. The RBS capacity is a nominal 10 percent, a relatively small capacity. The licensee reviewed startup test data and operating records and determined that the MCFL had been normally set at 109 or 110 percent. GE calculation for the generic BWR-6 and this MCFL setting with an assumed MCPR limit of 1.18, shows that the MCPR safety limit would be exceeded by 0.02 during the postulated event.

A licensee review of plant operating records disclosed the MCPR operating limit margin has always been greater than 0.02; the smallest margin occurred recently (September 9, 1989) and was 0.0377. The licensee concludes from this that, had the postulated event occurred, the resulting transient would not have caused the limit to be exceeded. The licensee anticipates that RBS' specific analyses in progress will disclose a margin of safety greater than that currently calculated. This analysis is to be complete by the end of December 1989.

On September 1, 1989, licensee management issued Standing Order 82 to the operators. This order described the event, parametric responses to the event, and immediate operator actions to enhance the margin to the operating limit in the event of single turbine control valve closure without immediate unit trip. These actions included utilizing recirculation flow control to reduce reactor power to 80 percent, verifying that the bypass valves are closed, contacting Reactor Engineering to determine the necessity of reducing the rod line, and other nonimmediate actions. Also, for additional conservatism, the maximum fraction of limiting CPR (MFLCPR) was reduced from 1.00 to 0.98. The inspector routinely verified, through control room log entries and observation of the process computer P-1 printout, that the unit was operated within the bounds of this parameter.

During a recent forced outage (September 29-30, 1989), the licensee reset the MCFL setting to the GE recommended setting of 115 percent.

This setting was verified by the inspector. The MCFL was not adjusted prior to this because the control had behaved erratically in the past. By adjusting the control during the shutdown, the potential for inadvertently inducing a transient during operation with a possible unit trip was avoided (the MCFL may have caused the control valves to close).

No violations or deviations were identified.

8. Exit Interview

An exit interview was conducted with licensee representatives identified in paragraph 1 on October 13, 1989. During this interview, the NRC inspectors reviewed the scope and findings of the report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.