ENCLOSURE 2

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-416/96-08

License: NPF-29

Licensee: Entergy Operations, Inc.
P.O. Box 756
Port Gibson, Mississippi

Facility Name: Grand Gulf Nuclear Station

Inspection At: Port Gibson, Mississippi

Inspection Conducted: February 26 through March 25, 1996

Inspector: K. Weaver, Resident Inspector

Approved: Doyle A Pick for 4/10/96
P. H. Harrell, Acting Chief, Project Branch D Date

Inspection Summary

Areas Inspected: A special, announced inspection to review the licensee's corrective actions associated with the apparent degradation of both trains of the control room air conditioning units, and to review the operational, maintenance, and testing activities to verify that the control room air conditioning units were capable of performing the safety functions required by the licensing basis.

Results:

- Upon reviewing the Updated Final Safety Analysis Report (UFSAR), Technical Specification (TS) bases documents, and the vendor established parameters, the inspector verified the licensee's conclusion that the control room heating, ventilation and air conditioning (HVAC) units were capable of performing their designed safety function (Section 1.4).

- After reviewing the preventive maintenance (PM) activities, it was concluded that the majority of the vendor recommendations had been incorporated into the licensee's PM program (Section 1.5.1).

- The system engineer was not aware that the pressure indicators in the air conditioning systems performed a safety function in that the indicators were used to mitigate the consequences of a loss of

instrument air event, which provides assurance of the continued operability of the air conditioning systems (Section 1.5.2).

- A material nonconformance report (MNCR) was not initiated in accordance with Procedure 01-S-03-3 upon discovery of the fact that the control room air conditioning Unit B Pressure Indicator SZ51R002B had a history of repetitive failures and historically, even after the gauge was recalibrated, it was not reading accurately. Therefore, no evaluation was performed for the impact of operations personnel not being able to perform Step 3.14 of Off-Normal Event Procedure 01-1-02-C-9, "Loss of Instrument Air," due to the inaccurate pressure gage reading (Section 1.5.2).

Summary of Inspection Findings:

New Items

- Violation 416/9608-01: Failure to identify and document the repetitive failures and inaccurate readings of Pressure Indicator SZ51R002B in accordance with Procedure 01-S-03-3 (Section 1.5.2).

Attachment:

- Persons Contacted and Exit Meeting

DETAILS

1 REVIEW OF THE CONTROL ROOM AIR CONDITIONING UNITS (71707, 37551)

1.1 Background Information

On February 19, 1996, the licensee notified the NRC that the control room HVAC cooling coils were found incapable of removing the required heat load of 658,000 BTU/hr following a loss-of-coolant accident (LOCA). The NRC initiated this special inspection to review the licensee's corrective actions and the implementation of the actions associated with the apparent degradation of the control room HVAC units and to verify that the system could perform the safety functions required by the licensing basis. Subsequent to this inspection, the licensee determined that the control room HVAC units were not outside the design basis in that, even in a degraded condition, the control room HVAC units could maintain the control room below the 120°F allowed by UFSAR, Appendix 16B, "Technical Requirements Manual;" therefore, the licensee withdrew their notification to the NRC.

The inspector performed system walkdowns, reviews, and interviews with licensee personnel to independently confirm that the licensee had implemented corrective actions to ensure that the control room HVAC units would perform the required safety functions.

1.2 System Description

During normal operation, while one control room HVAC was operated and the other unit remained in standby condition, air entered the control room HVAC unit and passed through prefilters, over cooling coils, and was cooled by giving up its heat to the refrigerant. The refrigerant entered the cooling coil section at approximately 242 psig and 103°F. It passed through thermo-expansion valves that caused the refrigerant pressure and temperature to drop to approximately 73 psig and 44°F. Air passing over the cooling coils at approximately 73°F caused the refrigerant to evaporate. The compressor then raised the temperature and pressure of the refrigerant to approximately 115°F and 242 psig. The refrigerant then entered the condenser on the shell side and returned to a liquid state by rejecting heat to plant service water on the tube side. Plant service water flowing through the condenser for each unit was regulated by Pressure Indicator Flow Controllers Z51R008A and B that positioned Flow Control Valves Z51F073A and B in response to condenser pressure. The plant service water system was backed up by the standby service water system, which cooled the control room HVAC condensers in the event of an emergency. A filter/dryer was located between the condenser and the cooling coils to protect the thermo-expansion valves from dirt and particulates.

1.3 Design and Licensing Basis Review

Section 9.4.1.1.2 of the UFSAR states, in part, that the system is designed to provide a controlled temperature environment to ensure the continued operation of safety-related equipment under accident conditions. The maximum temperature limit in the control room for equipment performance is governed by Appendix 16B.

UFSAR, Appendix 16B, "Technical Requirements Manual," Table 6.7.3-1, "Area Temperature Monitoring," required that 90°F was the maximum control room temperature limit. Technical Requirements Manual 6.7.3, Condition A required that, if the limit of 90°F was exceeded, restore the temperature to within limits in 8 hours and, if Condition A was not met, to initiate action to prepare and submit a special report to the NRC within the next 30 days providing a record of the amount by which and the cumulative time the temperature in the affected area exceeded its limit and an analysis to demonstrate the continued operability of the affected equipment. Technical Requirements Manual 6.7.3, Condition C required that, if the temperature limit was exceeded by greater than 30°F, then the equipment within the affected area was to be declared inoperable (i.e., equipment in the control room).

Based on review of the UFSAR and TS bases documents, the inspector concluded that no design basis heat load, in a BTU/hr value for the control room HVAC units, was given in either the UFSAR or the TS bases documents. The only values specified for the control room HVAC units were the control room area temperatures. The control room HVAC system post-LOCA cooling loads, calculated by the licensee's engineering staff in Engineering Calculation MC-QSZ51-96006, "Thermal Performance Evaluation of the Control Room Air Conditioning System" using the 90°F maximum control room limit, was 658,300 BTU/hr.

The inspector reviewed Engineering Calculation MC-QSZ51-87068, "Control Room HVAC System - Post LOCA Cooling Loads," and Engineering Calculation MC-QSZ51-96006, and concluded that the 658,300 BTU/hr total heat load, calculated by the licensee, appeared to be accurate.

1.4 Identification of the Control Room HVAC Units Apparent Degradation

The licensee received Amendment 120 to the Facility Operating License, which required that TS Surveillance Requirement 3.7.4.1 be successfully demonstrated prior to February 1, 1996. Surveillance Requirement 3.7.4.1 requires, in part, verification that each control room HVAC subsystem has the capability to remove the assumed heat load.

As part of the licensee's TS improvement program, Technical Special Test Instructions (TSTI) SZ51-95-007-0-S, "Control Room Air Conditioning Unit Z51B002A Assumed Heat Load Demonstration," and SZ51-95-008-0-S, "Control Room Air Conditioning Unit Z51B002B Assumed Heat Load Demonstration," were developed to satisfy Surveillance Requirement 3.7.4.1. The as-found

performance data obtained during the initial performance of the tests indicated that the control room HVAC units might not have had the capability of removing the maximum design based accident (DBA) heat loads with a single HVAC unit. The licensee's engineering staff evaluated the data and determined the post-LOCA heat removal, as-found capability of HVAC Unit A was 356,301 BTU/hr and HVAC Unit B was 431,725 BTU/hr.

During the initial performance of TSTI SZ51-95-007-0-S for control room HVAC Unit A, drastic temperature differences were experienced at each thermo-expansion valve outlet. The licensee initiated MNCR 96-004 and Work Order 157636. The corrective actions performed under Work Order 157636 corrected the original nonconformance by raising the compressor suction pressure. The licensee stated that this elevated suction pressure provided the necessary corrective action to allow all six thermo-expansion valves to maintain the correct superheat across the evaporator. In addition, a mechanical and chemical cleaning of the HVAC unit condensers was performed. After the corrective actions were performed, the TSTI SZ51-95-007-0-S was reperformed and new data taken. Based on engineering review and evaluation of the new data taken, the licensee stated that control room HVAC Unit A was capable of removing an assumed heat load of 658,300 BTU/hr.

During the initial performance of TSTI SZ51-95-008-0-S for control room HVAC Unit B, the licensee determined that two of the six thermo-expansion valves were not regulating properly to maintain the correct superheat across the evaporator. The licensee's corrective actions included adjusting two of the unit's expansion valves, the addition of freon, and the change out of the filter dryer. Subsequently, TSTI SZ51-95-008-0-S was reperformed and the licensee stated that the control room HVAC Unit B was capable of removing an assumed heat load of 658,300 BTU/hr based on Engineering Calculation MC-QSZ51-96006.

The as-found data taken during the initial performance testing of the control room HVAC Units A and B was assessed by the licensee and used in Engineering Calculation MC-QSZ51-96009, "Thermal Performance Evaluation of the As-Found Condition of the Control Room Air Conditioning Units (MNCR 004-96). The results of the licensee's assessment and Engineering Calculation MC-QSZ51-96009 were used to determine the past operability and reportability of the as-found conditions of the control room HVAC units. Based on Engineering Calculation MC-QSZ51-96009, the licensee concluded that the control room temperature would have been maintained below 100°F during the most limiting post-LOCA conditions with either of the control room HVAC units in service. Subsequent to the licensee's engineering assessment and determination, the licensee retracted their initial NRC notification.

The inspector reviewed the new data taken and recorded on the TSTI data sheets during the final performance tests, and compared the data with Engineering Calculation MC-QSZ51-96006 and the vendor technical manual established parameters. Based on review of the final performance test data, Engineering Calculation MC-QSZ51-96006, and the vendor technical manual established

parameters, the inspector agreed with the licensee's conclusion that the control room HVAC units could maintain the control room temperature within the required limits.

1.5 Historical Review of Design Basis Calculations, Events, and Problems

1.5.1 Maintenance Activities and Vendor Recommendations

The inspector questioned licensee personnel concerning their preventive maintenance activities associated with the control room HVAC units and reviewed the vendor technical manual for the control room HVAC units to determine if maintenance was being performed at regular intervals in accordance with vendor recommendations. The inspector noted that part of the corrective actions, during the initial testing of the units, was to add refrigerant and that there was no repetitive task for checking the refrigerant charge listed in the licensee's computer data base. The licensee indicated that the refrigerant charge was usually checked during the system engineer's monthly system walkdown. The inspector also questioned licensee personnel concerning mechanical and chemical cleaning of the condenser, since that was also part of the licensee's corrective action during the initial performance test.

The licensee stated that Repetitive Tasks 11063 and 11064 had been developed to clean the control room HVAC units condensers on an annual basis. Based on review of the recommendations identified in the vendor technical manual and the PM tasks listed in the licensee's computer data base, the inspector concluded that the majority of the vendor recommendations had been identified in the licensee's PM program.

1.5.2 Engineering Report 92-0033, "Cooling Water Requirements for the Condensers Used on Control Room HVAC Units QSZ51B002A-A & QSZ51B002B-B Following a LOP/LOCA"

The inspector reviewed Engineering Report 92-003 and noted that it stated that each of the control room HVAC units was equipped with flow control valves (Valve SZ51F073A and B), which were positioned by a controller to regulate the flow of cooling water through the condensers to maintain a pressure of 242 psig on the freon side of the condenser. Both the air supply to the pneumatic actuator and the power supply to the control circuity used on the flow control valves were nonsafety-related and would not be available following a DBA. The flow control valves have a fail-safe position of fully open.

If no actions were taken to regulate the flow of standby service water to the units, the condensing temperature and pressure in the condenser would drop, resulting in lower suction pressures at the compressors and causing the compressors to start unloading or dropping cylinders, thereby, reducing the capacity of the units. Each of the compressors was equipped with unloaders on all five cylinders. The compressors began unloading when the suction pressure dropped below approximately 70 psig and were set to be fully unloaded when the

suction pressure reached 58 psig. Engineering Report 92-0033 stated that it was very important that steps be taken to regulate the flow of cooling water through the condensers to ensure that the units were capable of removing the DBA heat load from the control room envelope.

To address the concerns listed in Engineering Report 92-0033, the licensee incorporated instructions for operations personnel in Off-Normal Procedure 05-1-02-V-9, "Loss of Instrument Air." Step 3.14 of Procedure 05-1-02-V-9 stated, in part, that control room air conditioning Units Z51B002A(B) temperature control valves fail open on loss of instrument air, causing compressors to unload on low freon pressure, thus reducing unit cooling capacity. To maintain acceptable control room temperature, it may be necessary to manually throttle Valve P41-F075A(B) for the running air conditioning unit to maintain condenser pressure between 235 and 245 psig as indicated on local Indicators SZ51R002A(B).

The inspector walked down the control room HVAC units to verify that Step 3.14 could be performed by operations personnel, if needed. During the walkdown, the inspector noted that the local Pressure Indicator SZ51R002A was reading approximately 350 psig, instead of the appropriate reading of 235 to 245 psig. The inspector questioned the system engineer and a representative of operations staff concerning whether Step 3.14 of Procedure 05-1-02-V-9 could be performed. The system engineer and the operations representative both agreed that the procedure could not be performed because Pressure Indicator SZ51R002A had failed and was not indicating properly. The inspector questioned the system engineer and maintenance personnel and reviewed the maintenance history for the indicators and discovered that the indicators were unreliable based on a history of repetitive failures on Pressure Indicator SZ51R002B and the subsequent failure of Pressure Indicator SZ51R002A due to high pulsations from the compressor. In addition, historically, even after Pressure Indicator SZ51R002B had been calibrated, there was a 30 to 40 psig mismatch between Pressure Indicator SZ51R002B indication and condenser pressure.

During conversations, the licensee stated that the Pressure Indicator Flow Controller SZ51R008A and B could also be used for indication to maintain the pressures specified in Procedure 05-1-02-V-9. However, during the inspector's walkdown, it was noted that no identification labels were on these pressure indicators and they were not listed in Procedure 05-1-02-V-9. The licensee, subsequently, installed identification labels for Pressure Indicator Flow Controller SZ51R008A and B.

The inspector questioned licensee personnel if an MNCR had been written concerning the repetitive failures and the inaccurate readings on Pressure Indicator SZ51R002B. Licensee personnel indicated that no MNCR had been previously written. However, the failures were being trended in the licensee's maintenance monitoring program, had been evaluated by the system engineer, and a modification had been made to dampen the pulsations for Pressure Indicator SZ51R002B. The inspector questioned licensee personnel concerning why the modification had not been installed for Pressure

Indicator SZ51R002A since the configuration was the same for both units and was told that no previous failures had been noted until the inspector had recently walked down the system. Subsequently, the inspector discovered that control room HVAC Unit B was the preferred unit due to noise caused by control room HVAC Unit A and was usually the unit in operation and that the Unit A was usually in standby condition. The normal operation of the units was an indication of why the failure of the pressure indicator on Unit B was more frequent than the pressure indicator on Unit A.

The inspector questioned the system engineer to determine if he was knowledgeable of the fact that Pressure Indicators SZ51R002A and B were specified for used in the Operations Off-Normal Procedure 05-1-02-V-9 and he stated that he did not realize that the pressure indicators were being used. The inspector questioned licensee management personnel to determine if it was management's expectations that system engineers be aware of components in the systems that are used in operations off-normal procedures. The licensee management personnel indicated that this was not their expectation nor a requirement of system engineering personnel. Due to this inspection, the system engineer subsequently initiated an MNCR to evaluate the performance of the pressure indicators.

Since no MNCR had been previously initiated for the repetitive failures and the inaccurate reading of Pressure Indicator SZ51R002B, operations personnel were not informed. Therefore, no evaluation was performed for the impact of precluding operations personnel from performing Step 3.14 of Procedure 05-1-02-V-9 and no compensatory measures were taken. Subsequently, operations personnel initiated a temporary procedure change to Procedure 05-1-02-V-9 to substitute Pressure Indicators SZ51R002A and B with Pressure Indicator Flow Controls SZ51R008A and -B.

Procedure 01-S-03-3, "Material Nonconformance Reports," states, in part, that any individual or organization, including corporate and contract personnel, shall initiate a deficiency reporting document whenever a deficiency is discovered. Noncomformance reports must be used for all installed (declared operable or not) or previously installed (and declared operable) plant material nonconformances. Failure to identify and document the repetitive failures and inaccurate readings of Pressure Indicator SZ51R002B, in accordance with Procedure 01-S-03-3, is a violation of Criterion V of Appendix B to 10 CFR Part 50 (416/9608-01).

2 UFSAR REVIEW (71707, 37551)

A recent discovery of a licensee operating a facility in a manner contrary to the UFSAR description highlighted the need for a special focused review that compares plant practices, procedures, and parameters to the UFSAR description. While performing the inspections discussed in this report, the inspector reviewed the applicable portions of the UFSAR that related to the areas inspected. The inspector verified that the UFSAR wording was consistent with the observed plant practices, procedures, and parameters.

ATTACHMENT

1 PERSONS CONTACTED

Licensee Personnel

A. Barfield, Engineering Supervisor, Nuclear Plant Engineering
K. Black, Senior Engineer, Nuclear Plant Engineering
C. Bottemiller, Superintendent, Plant Licensing
D. Cupstid, Technical Coordinator, Performance and System Engineering
C. Dugger, Manager, Plant Operations
C. Ellsaesser, Manager, Performance and System Engineering
W. McCain, Engineering Supervisor, Nuclear Plant Engineering
D. Nold, System Engineer, Performance and System Engineering
R. Ruffin. Licensing Specialist, Plant Licensing
S. Saunders, Manager, Electrical and I&C, Nuclear Plant Engineering
R. Wright, Engineering Supervisor, Nuclear Plant Engineering

The personnel listed above attended the exit meeting. In addition to these personnel, the inspector contacted other personnel during this inspection period.

2 EXIT MEETING

An exit meeting was conducted on March 25, 1996. During this meeting, the inspector 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 inspector.