UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AEOD/E217

MAR 3 1 1982

This is an internal, pre-decisional document not necessarily representing a position of AEOD or NRC.

MEMORANDUM FOR: Carlyle Michelson, Director
Office for Analysis and Evaluation
of Operational Data

FROM: Matthew Chiramal
Office for Analysis and Evaluation
of Operational Data

SUBJECT: SCRAM PILOT SOLENOID VALVE FAILURES DUE TO LOW VOLTAGE - GRAND GULF 1

The enclosed deficiency report is from Mississippi Power and Light Company, reported under 10 CFR 50.55(e) and 10 CFR 21, regarding failure of scram pilot solenoid valves due to low voltage during preoperational testing of the Control Rod Drive (CRD) system. The report states that during CRD testing the scram pilot valves were found stuck in the energized position with the solenoids de-energized. This prevented the actuation of the scram inlet and outlet valves and thus would have prevented the control rods from scramming. Investigation revealed that the valves were damaged by being operated with insufficient voltage being supplied to the solenoid coils. The low voltage, which was caused by use of cables of insufficient capacity to supply power to the solenoids, induced "chattering" of the solenoid core internals resulting in damage and subsequent sticking.

Communication with Region II personnel elicited the following additional details. The cable runs from the RPS bus to the valves were between 400 to 800 feet. The solenoids are rated for 108 V ac minimum (rating being 120 V +10%). During preoperational testing the worst case voltage seen at the failed solenoid was 101 volt (with the bus at a nominal 120 V ac). The low voltage trip setpoint at the bus is 117 V ac. Thus, in this case the undervoltage protection did not provide adequate protection to the solenoid valves. The problem has been corrected at Grand Gulf by replacing all damaged solenoids and using cables of adequate capacity. (Region II personnel has conducted a quick survey at other BWRs under construction and has concluded that this problem was confined to Grand Gulf.)

We did a quick evaluation of the problem as it applies to operating reactors. We found that the ongoing NRR review of Reactor Protection Systems (RPS) power monitoring system design modification and associated technical specification changes for operating reactors, does address system over-voltage, under-voltage, and under-frequency of power sources and service

requirements of RPS components. The technical reviewers have been looking into voltage drop considerations of cables and terminal voltages at equipment, to assure adequacy of the design modification and technical specification values. Based on the above we can assume that the problems associated with the voltage of the RPS power supplies are being adequately addressed for operating reactors.

Matthew Chiramal
Reactor Operations Analysis Branch
Office for Analysis and Evaluation
of Operational Data

Enclosure:
As stated

cc w/enclosure:
SRubin, AEOD
FAshe, AEOD
CJHeltemes, AEOD

MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

December 1, 1981

Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 3100
Atlanta, Georgia 30303

Attention: Mr. J. P. O'Reilly, Regional Administrator

Dear Mr. O'Reilly:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416/417
File 0260/15525/15526
PRD-81/35, Final Report,
Failure of CRD Hydraulic System
Screw Pilot Valves
AECM-81/476

Reference: 1) AECM-81/379, 10/1/81

On August 26, 1981 Mississippi Power & Light Company notified Mr. Virgil Brownlee, of your office, of a Potentially Reportable Deficiency (PRD) at the Grand Gulf Nuclear Station (GGNS) construction site. The deficiency concerns the failure of the Control Rod Drive (CRD) Hydraulic System Screw Pilot Valves.

Based on the results of our investigation we have determined that this deficiency is reportable under 10CFR50.55(e) and 10CFR21. All details are provided in our attached Final Report.

Yours truly,

For J. P. McGaughy, Jr.

KJS:dr
ATTACHMENT

cc: See page 2

51

8112140063 811201
PDR ADOCK 05000416
S PDR

Member Middle South Utilities System

cc: Mr. H. L. Stampley
Mr. R. B. McCehee
Mr. T. B. Conner

Mr. Richard C. DeYoung, Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. G. B. Taylor
South Miss. Electric Power Association
P. O. Box 1589
Hattiesburg, MS 39401

FINAL REPORT FOR PRD-81/35

1. Name and address of the individual ... informing the commission:

   J. P. McGaughy, Jr.
   Assistant Vice-President, Nuclear Production
   P.O. Box 1640
   Jackson, Mississippi 39205

   Notification of Part 21 applicability made to Mr. J. P. O'Reilly, NRC, Region II by letter AECM-81/476, December 1, 1981.

2. Identification of the facility ... which ... contains a deficiency:

   Grand Gulf Nuclear Station (GGNS) Unit 1
   Port Gibson, Mississippi 39150

3. Identification of the firm ... supplying the basic component which ... contains a deficiency:

   Undersized cables which caused damage to the valves were supplied by Bechtel Power Corporation, Gaithersburg, Maryland.

4. Nature of the deficiency ... and the safety hazard which ... could be created by such a deficiency ...:

   A. Description of the Deficiency

   During Control Rod Drive (CRD) testing, fourteen (14) scram pilot valves were found stuck in the energized state when both of the solenoids were de-energized. This prevents the actuation of the scram inlet and outlet valves and thus prevents the control rods from scramming. The deficiency affects only the Control Rod Drive (CRD) Hydraulic System (System C11) in Unit 1.

   B. Analysis of Safety Implications

   This situation could lead to the failure of the Control Rods to scram and jeopardize the reactor pressure boundary and nuclear fuel integrity. This could adversely affect the safety of operations of the nuclear power plant and would be a substantial safety hazard.

5. The date on which the information of such deficiency ... was obtained.

   Mississippi Power and Light received information of the deficiency on August 25, 1981. We reported the deficiency to Mr. V. Brownlee, of your office as a Potentially Reportable Deficiency on August 26, 1981. Since that date MP&L has filed one (1) interim report to inform the Commission of the progress and status of this deficiency. An evaluation for Part 21 has been completed.

6. In the case of the basic component ... the number and location of all such components.

There are fourteen (14) damaged Control Rod Drive (CRD) Scram Pilot Valves located in Unit 1 at GGNS.

We do not have knowledge of the location of defective equipment located other than at GGNS.

7. The corrective action which has been taken ... the name of the individual ... responsible for the action; and the length of time that has been ... taken to complete the action.

A. Corrective Actions Taken

The valves that failed did not contain a defect. They were damaged by being operated with insufficient voltage being supplied to the solenoid coils by the Reactor Protection System due to insufficient cable size. The low voltage caused "chattering" of the solenoid core internals, resulting in damage and subsequent sticking of the internals, preventing proper operation.

The deficiency was caused by cables of insufficient capacity being used to supply power to the solenoid valves, resulting in less than minimum voltage being supplied. Mississippi Power & Light feels that our Constructor should have more thoroughly evaluated the design in light of the physical configuration and valve power requirements. The affected Reactor Protection System Supply Cables are being replaced with Cables of sufficient capacity. All scram pilot valves are being rebuilt to replace all damaged parts.

B. Responsible Individual

G. B. Rogers, Jr.
Site Manager
Mississippi Power and Light Company

C. Length of Time to Complete Actions

Mississippi Power & Light received information of the deficiency on August 24, 1981. All work will be completed prior to Unit 1 fuel load. Our Constructor is tracking this repair on Startup Field Report (SFR)-1E-1959.

8. Any advice related to the deficiency ... that has been, is being, or will be given to purchasers or licensees:

As the deficiency did not originate with MP&L, we have no advice to offer.

MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

December 1, 1981

Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 3100
Atlanta, Georgia 30303

Attention: Mr. J. P. O'Reilly, Regional Administrator

Dear Mr. O'Reilly:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416/417
File 0260/15525/15526
PRD-81/35, Final Report,
Failure of CRD Hydraulic System
Screw Pilot Valves
AECM-81/476

Reference: 1) AECM-81/379, 10/1/81

On August 26, 1981 Mississippi Power & Light Company notified Mr. Virgil Brownlee, of your office, of a Potentially Reportable Deficiency (PRD) at the Grand Gulf Nuclear Station (GGNS) construction site. The deficiency concerns the failure of the Control Rod Drive (CRD) Hydraulic System Screw Pilot Valves.

Based on the results of our investigation we have determined that this deficiency is reportable under 10CFR50.55(e) and 10CFR21. All details are provided in our attached Final Report.

Yours truly,

For L. F. McCaughey, Jr.

WJH:ft
ATTACHMENT

cc: See page 2

9112140063 811201
PDR ADOCK 05000416
S PDR

Member Middle South Utilities System

cc: Mr. R. L. Stampley
Mr. R. B. [illegible]
Mr. T. B. Conner

Mr. Richard C. DeYoung, Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. G. B. Taylor
South Miss. Electric Power Association
P. O. Box 1589
Hattiesburg, MS 39401

FINAL REPORT FOR PRD-81/35

1. Name and address of the individual ... informing the commission:

   J. P. McGaughy, Jr.
   Assistant Vice-President, Nuclear Production
   P.O. Box 1640
   Jackson, Mississippi 39205

   Notification of Part 21 applicability made to Mr. J. P. O'Reilly, NRC, Region II by letter AECM-81/476, December 1, 1981.

2. Identification of the facility ... which ... contains a deficiency:

   Grand Gulf Nuclear Station (GGNS) Unit 1
   Port Gibson, Mississippi 39150

3. Identification of the firm ... supplying the basic component which ... contains a deficiency:

   Undersized cables which caused damage to the valves were supplied by Bechtel Power Corporation, Gaithersburg, Maryland.

4. Nature of the deficiency ... and the safety hazard which ... could be created by such a deficiency ...:

   A. Description of the Deficiency

   During Control Rod Drive (CRD) testing, fourteen (14) scram pilot valves were found stuck in the energized state when both of the solenoids were de-energized. This prevents the actuation of the scram inlet and outlet valves and thus prevents the control rods from scramming. The deficiency affects only the Control Rod Drive (CRD) Hydraulic System (System C11) in Unit 1.

   B. Analysis of Safety Implications

   This situation could lead to the failure of the Control Rods to scram and jeopardize the reactor pressure boundary and nuclear fuel integrity. This could adversely affect the safety of operations of the nuclear power plant and would be a substantial safety hazard.

5. The date on which the information of such deficiency ... was obtained.

   Mississippi Power and Light received information of the deficiency on August 25, 1981. We reported the deficiency to Mr. V. Brownlee, of your office as a Potentially Reportable Deficiency on August 26, 1981. Since that date MP&L has filed one (1) interim report to inform the Commission of the progress and status of this deficiency. An evaluation for Part 21 has been completed.

6. In the case of the basic component ... the number and location of all such components.

There are fourteen (14) damaged Control Rod Drive (CRD) Scram Pilot Valves located in Unit 1 at GGNS.

We do not have knowledge of the location of defective equipment located other than at GGNS.

7. The corrective action which has been taken ... the name of the individual ... responsible for the action; and the length of time that has been ... taken to complete the action.

A. Corrective Actions Taken

The valves that failed did not contain a defect. They were damaged by being operated with insufficient voltage being supplied to the solenoid coils by the Reactor Protection System due to insufficient cable size. The low voltage caused "chattering" of the solenoid core internals, resulting in damage and subsequent sticking of the internals, preventing proper operation.

The deficiency was caused by cables of insufficient capacity being used to supply power to the solenoid valves, resulting in less than minimum voltage being supplied. Mississippi Power & Light feels that our Constructor should have more thoroughly evaluated the design in light of the physical configuration and valve power requirements. The affected Reactor Protection System Supply Cables are being replaced with Cables of sufficient capacity. All scram pilot valves are being rebuilt to replace all damaged parts.

B. Responsible Individual

C. B. Rogers, Jr.
Site Manager
Mississippi Power and Light Company

C. Length of Time to Complete Actions

Mississippi Power & Light received information of the deficiency on August 26, 1981. All work will be completed prior to Unit 1 fuel load. Our Constructor is tracking this repair on Startup Field Report (SFR)-15-1959.

8. Any advice related to the deficiency ... that has been, is being, or will be given to purchasers or licensees:

As the deficiency did not originate with MP&L, we have no advice to offer.