



# MISSISSIPPI POWER & LIGHT COMPANY

*Helping Build Mississippi*

P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

JAMES P. McGAUGHY, JR.  
ASSISTANT VICE PRESIDENT

April 15, 1982

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-81/45, Final Report,  
Transamerica Delaval Standby  
Diesel Generator  
AECM-82/157

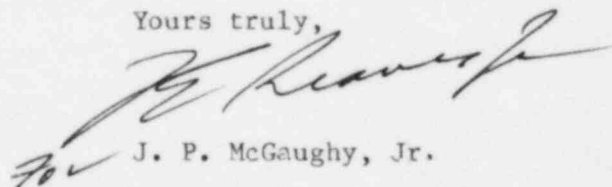
On November 10, 1981, Mississippi Power & Light Company notified Mr. P. A. Taylor, of your office, of a Potentially Reportable Deficiency (PRD) at the Grand Gulf Nuclear Station (GGNS) construction site. The deficiency concerns spherical washer subassemblies on the Transamerica Delaval Division II Standby Diesel Generator.

During our investigation of this matter, additional deficiencies were identified. The disposition of each of these deficiencies is delineated in our attached Final Report.

Based on the results of our investigation MP&L has determined that this deficiency, pertaining to the spherical washer subassembly, is reportable under the provisions of 10CFR50.55(e) and 10CFR21.

This report was originally due on March 15, 1982 but an extension until April 15, 1982 was granted by Mr. Ross Butcher, of your office, on March 12, 1982.

Yours truly,



J. P. McGaughy, Jr.

ACP:dr  
ATTACHMENT

cc: See page 2

OFFICIAL COPY

1227  
S-111

820601045/5

Member Middle South Utilities System

Mr. J. P. O'Reilly  
NRC

AECM-82/157  
Page 2

cc: Mr. N. L. Stampley  
Mr. R. B. McGehee  
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-81/45

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-82/157, April 15, 1982. This deficiency was also reported under 10CFR21 by Transamerica Delaval to the NRC in their letter dated November 5, 1981.

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

Grand Gulf Nuclear Station (GGNS) Units 1 and 2  
Port Gibson, Mississippi 39150

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

Supplied to Grand Gulf by Transamerica Delaval, Inc. located in  
Oakland, California.

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

A. Description of the Deficiency

During startup testing of the Division II Standby Diesel Generator a piston crown partially separated from the piston skirt due to the failure of one of the four (4) attachment stud bolts. The stud bolt failure could have likely been caused due to a deficiency of the spherical washer subassembly.

The cause of the initial deficiency of the piston crown partially separating from the piston skirt has been attributed to the failure of the spherical washers.

Three of the four spherical washers for the piston were broken in several pieces and showed contact wear in a circle on the outer edge of the concave washer surface. The fourth washer was not cracked and the contact area was on the inner half of the spherical seat. The Delaval analysis identifies that the cracked washers appeared to have been improperly manufactured. The sharp outer edge of the concave washer made contact with the convex washer at its outer edge producing a thin

ring of high contact stress. It then did not take much of a cyclic load to crack the case which had little support from the washer's core. The analysis concludes that the actual failure of the washers was due to the fact that a high load was placed on the outer edge instead of evenly throughout the washer, which then caused the cracks to occur.

The failure of the three washers then created a condition resulting in the failure of the stud connecting the piston crown and skirt. With three washers missing, the crown was able to bend the fourth stud and it failed in bending fatigue. This is indicated by the stud having cracked at the third or fourth thread engagement rather than the first thread engagement in the crown and by the threads that cracked having started on the side facing the center of the crown. The stud material was tested and found to exceed the specifications for strength.

Additional deficiencies pertaining to the internal engine parts were identified during the process of removing the pistons for modification on both the Division I and II Standby Diesel Generators. The extent of these deficiencies is as follows:

Additional Deficiency #1

The Division I diesel engine, cylinder #4 had excessive threading (grooved radially) on the crankshaft bearing. The crank pin was discolored and the cylinder liner was grooved in three (3) places 10 inches long by 1/16 inch deep.

Additional Deficiency #2

On the Division I diesel engine, cylinder #7, left bank, the cylinder link rod wrist pin was grooved and pitted approximately 1/16 inch deep. The wrist pin was also discolored.

These deficiencies were also analyzed by Delaval. The cause of each of the nonconformances is as follows:

Additional Deficiency #1

Delaval has stated that the cylinder liner damage (i.e. grooving) was probably caused by debris that entered the cylinder during assembly or initial startup while the scored crank pin and bearing shell was probably caused by transient material in the lube oil system.

Additional Deficiency #2

Delaval has stated that foreign matter in the lube oil is suspected to have caused a blockage of oil to the pin and bushing. This blockage in turn caused the chrome chipping and bushing wear that was evident.

In summary, the causes of the deficiencies can be grouped into two (2) categories:

1. Foreign matter in the lube oil.
2. Foreign matter from assembly or induced during engine startup from the air intake system.

An oil sample was taken of the lube oil from both engines and was analyzed and found to be satisfactory by Mobil Oil Corporation with no parameters out of the normal.

B. Analysis of Safety Implications

The determination has been made that if the initial identified deficiency had gone uncorrected, the failure of the stud bolts could render the engine inoperable. If the diesels were required to provide AC power to the Division 1 and 2 ESF bus during a LOCA condition or loss of offsite power, the loss of operability would have prevented the diesels from performing their design function which could have had an adverse effect on the safe operations of the plant.

From discussion with Delaval, Additional Deficiency #2 could have affected the engine operability or availability due to failure of the bushing which showed excessive wear. Additional Deficiency #1 might possibly have affected engine operability or availability over a longer period of operation.

These additional deficiencies were limited to the Division I diesel engine. Neither of these nonconformances were generic problems.

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

Mississippi Power and Light received information of the deficiency on November 9, 1981. We reported the deficiency to Mr. P. A. Taylor of your office as a Potentially Reportable Deficiency on November 10, 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 and the MP&L "Responsible Officer," Mr. J. P. McGaughy, Jr., will be notified when he returns to his office.

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

MP&L has four (4) Transamerica Delaval diesel engines. Two (2) engines are installed in Unit 1 and the remaining two (2) will be installed in Unit 2.

Transamerica Delaval notified the Commission on November 5, 1981 that they also supplied engines with the potential defect to the Long Island Lighting Company, Shorham Nuclear Power Station and to Southern California Edison, San Onofre.

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 corrective action for the failure of the spherical washer was to return the pistons from the Unit 1 diesels, including spares, to Delaval for modifications and replacement of the spherical washers with Belleville washers per Delaval Service Information Memo No. 324. A magnetic particle examination was conducted to provide assurance that the replacement stud bolts were free of flaws prior to their installation.

The corrective action for the two deficiencies identified during the process of removing the pistons for modification consisted of replacing all damaged parts with new parts.

In addition, on the Division I diesel engine, the lube oil was flushed and replaced and the sump was cleaned out. Delaval had attributed the two Additional Deficiencies on that engine to the presence of transient foreign material in the lube oil system. Delaval stated that operation of the lube oil system for 72 hours without unusual collection of foreign matter in the lube oil strainers or filters should be sufficient to verify cleanliness.

Delaval has also requested that all intake air piping from the filters to the intake manifolds be visually inspected for signs of large weld scale and splatter, or other large debris on both engines. Plant Staff and Nuclear Plant Engineering have determined that this is not required to be done because the air system was hand cleaned and air blown as part of the pre-op flushing activity prior to initial operation. This is documented by flushing procedures 1P75-FC01 and 1P75-FC02 for the Division I and Division II engines, respectively. No additional work has been done to the system since that time which would have introduced any foreign matter into the system.

B. Responsible Individual

C. K. McCoy  
Nuclear Plant Manager  
Mississippi Power and Light Company

C. Length of Time to Complete Actions

The Unit 1 pistons have been modified according to Delaval Service Information Memo No. 324. A Maintenance Work Order (MWO) will be issued to check the strainers and filters after completion of the ECCS testing and prior to fuel load. The strainers and filters will be replaced at that time.

The Unit 2 pistons will be modified in the same manner after restart of Unit 2 construction. Bechtel Condition Report No. 7768 was originated to track the modification of the pistons for Unit 2.

The additional deficiencies are considered isolated occurrences on Unit 1 and the replacement of all of the damaged parts and lube oil on the Division I engine is complete.

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.