

May 9, 1985

DOCKETED
USNRC

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

'85 MAY 10 A10:23

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

In the Matter of)	
)	
THE CLEVELAND ELECTRIC)	Docket Nos. 50-440
ILLUMINATING COMPANY, <u>ET AL.</u>)	50-441
)	
(Perry Nuclear Power Plant,)	
Units 1 and 2))	

AFFIDAVIT OF EDWARD C. CHRISTIANSEN

City of Washington)	
)	ss
District of Columbia)	

I, Edward C. Christiansen, being duly sworn, state as follows:

1. I am employed by The Cleveland Electric Illuminating Company as a Senior Design Engineer. A complete description of my responsibilities with respect to the Transamerica Delaval, Inc. ("TDI") diesel generators at the Perry Nuclear Power Plant, as well as my technical and professional qualifications, appears following Tr. 2179 (April 9, 1985) and in my affidavit dated February 1, 1985, in support of Applicants' Motion for Summary Disposition of Issue 16, dated February 5, 1985. I

8505130076 850509
PDR ADOCK 05000440
G PDR

have personal knowledge of the matters set forth herein and believe them to be true and correct.

2. The item in the NRC Weekly Information Report -- Week ending March 22, 1985, attached as Exhibit "A" to OCRE's Motion to Reopen (and also attached as Exhibit "A" to this Affidavit) describes a failure in a check valve in the on-engine mounted air start system header of the Division 1 TDI diesel engine at Grand Gulf Nuclear Station, Unit 1.

3. Both TDI and Mississippi Power & Light Company ("MP&L") (the Grand Gulf licensee) filed letters with the NRC in accordance with 10 C.F.R. Part 21. The TDI letter dated March 12 is attached hereto as Exhibit "B". The MP&L letter dated April 26, 1985, is attached hereto as Exhibit "C".

4. As described in these exhibits, the Grand Gulf failure involved the lower guide from the disk of one of the air start system header check valves. A part of the guide broke off and became wedged in the starting air valve. An examination of the three other air start system header check valves in the Grand Gulf Division 1 engine showed that the disk assembly of one other check valve exhibited a circumferential crack of about 180 degrees.

5. In accordance with 10 C.F.R. Part 21, TDI's March 12 letter identified other TDI-supplied engines with the potential defect in the check valve. These facilities were Shoreham,

River Bend, Catawba, San Onofre, Midland and Rancho Seco. The Perry TDI diesels were not included on this list.

6. The Perry TDI diesels were not identified as being potentially affected by the air start system header check valve failure at Grand Gulf for an obvious reason: the Perry TDI diesels do not have an air start system header check valve. Nor do any other of TDI's DSRV-16 engines manufactured since about 1976.^{1/}

7. The Grand Gulf diesel engines (and the others identified in TDI's March 12 letter) include the check valve as part of the air start system header because these units include an air start header crossover. The crossover interconnects the two redundant air receiver tanks which supply starting air to the engine. With the air start header crossover, a failure in one receiver tank system would cause the redundant tank to lose its air supply. The air start system header check valves were therefore included in the design to isolate the two receiver tanks so that a failure of one could not cause the other to lose its air supply.

8. The air start header crossover was deleted from the DSRV-16 design in about 1976, prior to the fabrication of the

^{1/} These include the TDI diesel generators for Shearon Harris, Comanche Peak, Bellefonte, Vogtle, WPPSS 1 and 4, Maanshan (Taiwan Power Co.), Korean Nuclear Units 5-8, Phipps Bend, and Hartsville A and B.

Perry diesels. The air start system header check valves were also removed, since they were only needed to protect against a failure which the crossover made possible.

9. The air start system for the Perry diesels is fully redundant. This redundancy has been verified by tests at Perry and at TDI. Each of the two redundant air receiver tanks is capable by itself of providing enough starting air to start the diesel engine. This was demonstrated in the starting air capacity tests, successfully completed for the Perry Division 1 diesel on May 4, 1985, and for the Division 2 diesel on May 9, 1985. Five starts were made using starting air from only the left air receiver tank and another five using starting air from only the right receiver tank. In every test, the engines were successfully started and brought to operating speed within the time set by the Technical Specifications. Similar qualification testing had been performed earlier by TDI.

10. The isolated failure of the air start system header check valve at Grand Gulf in no way calls into question the TDI Owners Group Program. The check valves in question were sub-vendor supplied items, designed and manufactured by Williams Gauge Co. (Williams-Hager) of Pittsburgh, Pa. The valves are a standard design and are used in the natural gas industry and other industrial applications. Although the primary purpose of the Owners Group program was to revalidate

those components designed and fabricated by TDI, sub-vendor supplied items were also evaluated to determine whether there was any history of failures for such components in either nuclear or non-nuclear service and to determine whether the component was being properly applied by TDI.

11. The air start system header check valve is included in the Owners Group Component Tracking System, the computerized data base which collects adverse operating experience (both nuclear and non-nuclear) with diesel engines and components. (The Component Tracking System is discussed in Mr. Kammeyer's direct testimony at pp. 16-20.) The Component Tracking System shows no adverse experience with these check valves.

12. The Owners Group performed an engineering application review of the air start system header check valve used at Grand Gulf to determine whether the valve was adequately designed to perform its intended function. This included a comparison of the pressures that the valve would be subject to with the rating specified by TDI, an analysis of the valve's nozzle loadings, and a determination that the materials matched the conditions that the valve would see.

13. Because the air start system header check valve had no failure history in diesel engine use and because it was supplied by a sub-vendor, no quality revalidation was required.

14. Neither the Owners Group program nor any other program can totally prevent random isolated failure. Redundant diesel generators are provided for just that purpose. The Grand Gulf check valve failure, which was discovered after the engine had operated for approximately 1500 hours, appears to be such an isolated failure.

Edward C. Christiansen
Edward C. Christiansen

Subscribed and Sworn this

9 day of May, 1985

Kathleen Moore
Notary Public

My Commission Expires September 30, 1985

Exhibit A

- 2 -

Palo Verde, Units 1, 2 and 3

On March 15, 1985, Mr. E. Van Brunt, the Executive Vice President for Arizona Public Service Company (APS), informed us that the Board of Directors of APS has proposed a plan of restructure for the company.

In the present structure, APS has 6 wholly-owned subsidiaries. The new proposed structure will consist of a holding company (AZP Group) with APS and 3 of the previous entities not directly related to the utility business (Energy Development Co., Malapai Resources Co. and El Dorado Investment Co.) as its wholly-owned subsidiaries. The other 3 entities (APS Fuels Company, APS Finance Company, N.V., and Bixco, Inc.) will remain subsidiaries of APS. The initial Board of Directors of AZP Group will be the same as the current APS Board.

The proposed change will require approval by the IRS and a majority of the APS stockholders (annual stockholders meeting will be held on April 18, 1985).

Grand Gulf, Unit 1

A small piece of a metal pin (1" x 1/4" dia.) broken off of a check valve in the air start system caused the Division I emergency diesel generator to malfunction during a surveillance test.

The metal pin fragment was carried by the air to one of the cylinder air inlet valves, where it lodged between the valve disc and the seat, preventing the valve from closing. This allowed hot gases from the cylinder to get into the air start system resulting in the malfunction of the engine.

The licensee found the portion of the pin when it examined the air inlet valves after the malfunction. Examination of the other three check valves in the Division I air start system showed that one of the valves had a cracked pin on the disc which appeared to be near the failure point. The other two valve discs did not appear to have cracks in them. The discs from all four valves were replaced with new discs and the old discs were sent to the vendor for tests and examination to determine possible causes of failure.

The diesel generator manufacturer, Transamerica Delaval, Inc. issued a 10 CFR Part 21 report on this matter to the Office of Inspection and Enforcement on March 12, 1985. There are several plants that have the same design of check valves in the air start system.

MAR 22 1985

ENCLOSURE B



00# 9939002

Oakland, California 946
(415) 877-7400

18:51 90/50

Exhibit 13

March 12, 1985

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

Dear Sir:

In accordance with the requirements of Title 10, Chapter 10, Code of Federal Regulations, Part 21, Transamerica Delaval Inc., hereby notifies the Commission of a potential defect in a component of a DSR or DSRV Standby Diesel Generator. There could exist a potential problem with a Check Valve in the On-engine Mounted Starting Air Piping which could result in Engine non-availability.

Transamerica Delaval has supplied the DSR and DSRV Engines with the potential defect to the following sites:

<u>Utility</u>	<u>Site</u>	<u>Serial No.</u>	<u>Model</u>
Long Island Lighting	Shoreham	74010/12	DSR 48
Middle South Energy	Grand Gulf	74033/36	DSRV 16
Gulf States Utilities	River Bend	74039/40	DSR 48
Duke Power Company	Catawba	75017/20	DSRV 16
Southern California Edison	San Onofre	75041/42	DSRV 20
Consumers Power	Midland	77001/04	DSRV 12
SMED	Rancho Seco	81015/16	DSR 48

At Grand Gulf on March 11, during operational testing on Engine 74033, flames were noticed coming out of a flexible coupling on the Air Start Header Assembly. The Engine was shutdown and number 6 right bank Air Start Valve was removed. A 3/8 diameter, 7/8 long non-magnetic piece was observed lying on top of the Piston. This resulted in further examination, and it is felt that this piece broke off of a Starting Air Check Valve Disk. This Disk has a top and a bottom guide. It appears this piece broke off of the bottom guide. There are 4 of these Valves on the RV 16 Engine. Grand Gulf checked the other 3. One of these was cracked and the other 2 were ok. LPI was used to check these Valves.

These Check Valves were supplied by the Williams Gauge Co. (Williams-Hager) of Pittsburgh, PA. They were installed on the Engine by Transamerica Delaval.

Grand Gulf has the failed parts. They are conducting an investigation to determine the cause of failure.

85-03/13 15:09 P02 * 7157 TDI ENG/COMPRES/DAK

March 12, 1985

Page 2

U. S. Nuclear Regulatory Commission

We have contacted the Manufacturer to report this failure, and will meet with them March 13 so that they begin their investigation.

In the mean time, our recommendation for corrective action is to disassemble the Check Valves on the Engine and inspect the Disk Guide for cracks (LPI). Attached is a copy of the assembly drawing of this Valve showing the area of concern.

We will inform all the sites listed in Paragraph 2 on this letter of this potential problem by sending them copies of this letter as indicated on the cc's.

Since action is required by others, we cannot estimate at this time when the final corrective action will be complete. We will keep you informed of our progress.

Our evaluation of the potential problem was completed on March 12, 1985. We were informed by Grand Gulf of the potential problem late on March 11, 1985.

Very truly yours,

R. E. Boyer

R. E. Boyer
Manager, Quality Assurance

REB:hw
Attachments

85 03/13 15:09 P03 *4157 TDI ENG/COMPRES/DK

85 04/30 08:20 P01

OM 8171P GOLDSTEIN (MP&L) 14-MAR-85 14:53 PT
 Subject: CHECK VALVE FAILURE ON EDG
 TO: HARNES, MINNS, VANDENWALLE, PURCELL, SIMMONS, JEFF, COLUMBO, CARROSSINO,
 GUARINO, MCCLLOUD, GUCWA, GOLDSTEIN, HARNES
 UNIT: GRAND GULF NUCLEAR STATION, U-1
 DOC NO/LER NO: N/A
 EVENT DATE: 03/11/85
 NSSS/AE: GE/BECHTEL
 RATING: 1250MW
 DATE OF COMMERCIAL OPERATION: POWER ASCENSION TESTING

SUPPLEMENTAL DESCRIPTION:
 AN AIR START HEADER CHECK VALVE ON THE DIVISION I EMERGENCY DIESEL
 GENERATOR (EDG) FAILED.

EVENT DESCRIPTION:

DURING A ROUTINE MAINTENANCE RUN OF THE DIVISION I EDG ENGINE,
 SUPPLIED BY TRANSAMERICA DELAVAL, INC. (TDI), MODEL DSRV-14-4, IT WAS
 OBSERVED THAT THE #6 RIGHT BANK AIR START VALVE HAD BURNED.

DURING REMOVAL OF THE AIR START VALVE IT WAS DISCOVERED THAT A
 CYLINDRICAL METAL OBJECT, APPROXIMATELY 3/8 INCH IN DIAMETER AND 1
 INCH LONG HAD WEDGED BETWEEN THE VALVE AND HOUSING. A PRELIMINARY
 INVESTIGATION DETERMINED THAT THIS METAL OBJECT WAS A PART OF THE
 DISC ASSEMBLY FROM A CHECK VALVE IN THE AIR START SYSTEM HEADER.
 TO VERIFY THIS DETERMINATION AN INSPECTION WAS PERFORMED ON THE
 DISC ASSEMBLY ON EACH OF THE FOUR AIR START SYSTEM HEADER CHECK
 VALVES. DURING THIS INSPECTION THE LOWER DISC GUIDE (STEM) OF
 THE RIGHT BANK REAR CHECK VALVE WAS NOTED TO BE MISSING. THE
 MISSING PART WAS FOUND WEDGED IN THE #6 CYLINDER AIR START
 VALVE.

THIS FAILURE HAS BEEN REPORTED AS A PART 21 BY TDI.

SGS IS CURRENTLY IN PROGRESS OF PERFORMING AN INVESTIGATION TO
 DETERMINE THE CAUSE. DURING THE TIME OF FAILURE SGS 1 WAS IN A
 SHUTDOWN CONDITION (OUTAGE).

NO OTHER MECHANICAL DAMAGE HAS BEEN FOUND WHICH WAS CAUSED BY
 THE NOTED CONDITION.

COMMENTS:

THE CHECK VALVES, TDI PART #KE-008-000, WERE SUPPLIED TO TDI BY
 THE WILLIAM GALGE CO., MODEL #329-SR-SGM-300 AS A 3" SILENT
 CHECK VALVE.

IT IS ANTICIPATED THAT THIS EVENT WILL BE REVIEWED AT THE NEXT
 OI OWNERS GROUP MEETING SCHEDULED FOR MARCH 22, 1985.

SGS IS ANALYZING THE FAILED COMPONENT AND WILL PROVIDE
 ADDITIONAL INPUT WHEN OBTAINED.

Information Contact: STEVE DEHLER 5-1-85

Exhibit C



MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
 P. O. BOX 1840, JACKSON, MISSISSIPPI 39215-1840

April 26, 1985

NUCLEAR LICENSING & SAFETY DEPARTMENT

U. S. Nuclear Regulatory Commission
 Region II
 101 Marietta St., N. W., Suite 2900
 Atlanta, Georgia 30323

Attention: Dr. J. Nelson Grace, Regional Administrator

Dear Dr. Grace:

SUBJECT: Grand Gulf Nuclear Station
 Units 1 and 2
 Docket Nos. 50-416 and 50-417
 License No. NPF-29
 File: 0260/0511/0512
 Reportable Deficiency 85/02, Final
 Report - TDI Diesel Generator Air
 Start Header Check Valve Failure
 AECM-85/0133

On March 19, 1985, Mississippi Power & Light Company (MP&L) notified Mr. Robert Carroll of your office of a Reportable Deficiency at Grand Gulf Nuclear Station (GGNS) Unit 1. The deficiency concerns the failure of an air start header check valve on the Division I Diesel Generator.

This deficiency was determined to be reportable under the provisions of 10CFR21 for Unit 1. In addition, the deficiency has been determined reportable under the provisions of 10CFR21 and 10CFR50.55(e) for Unit 2. Attached is a final report on the subject.

Yours truly,

L. F. Dale

L. F. Dale
 Director

EBS/SHH:rw
 Attachment

cc: (See Next Page)

Attachment to AECM-85/0133
Page 1

FINAL 10CFR21/50.55(e) REPORT

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

J. B. Richard
Senior Vice President, Nuclear
P. O. Box 1640
Jackson, Mississippi 39205

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

Grand Gulf Nuclear Station (GGNS) Units 1 & 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., (TDI)
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 a surveillance test run of the Division I Emergency Diesel Generator Engine, TDI, Model DSRV-16-4, it was observed that the #6 right bank air start valve had failed.

During removal of the air start valve a cylindrical metal object, approximately 3/8 inch in diameter and 1 inch long was found on top of the piston during a cleanliness inspection required by the maintenance procedure used to replace the air start valve. A preliminary investigation determined that this metal object was a part of the disc assembly from a check valve in the on-engine mounted air start system header. To verify this determination a visual inspection was performed on the disc assembly on each of the four air start system header check valves. This inspection disclosed that the right bank rear check valve was missing a part of the lower disc guide. This missing part was the part found in the #6 right bank cylinder. The inspection on the Division I Diesel Generator also revealed the left bank rear check valve disc assembly exhibited a circumferential crack that extended approximately 180 degrees in roughly the same location as the fracture of the right bank rear check valve disc. The left bank front and right bank front check valves had no visible cracks upon visual examination of this same area. The Division II Diesel Generator air start header check valves were also inspected and no visible cracks were identified in these valves.

B. Analysis of Safety Implications:-

The failed check valve disc guide part was carried through the starting air system to the #6 right bank starting air valve where it became wedged between the starting air valve internals and valve housing. Based on matching indications on the air start valve and the cylindrical metal object during visual inspection following the event, it is postulated that the disc guide pin wedged in the valve, causing the valve to remain in the open position during engine operation, resulting in the failure of the air start valve. At some point during the event or the subsequent removal of the air start valve by maintenance personnel the object was freed and came to rest on top of the piston in the #6 right bank cylinder.

There are 2 check valves (front and rear) utilized on each air header (left bank and right bank). Multiple failures occurring on these four check valves is a highly unlikely event. However, it is conservatively postulated that the condition could lead to a subsequent loss of engine air start capability or availability and possibly affect subsequent engine operation. Since these check valves are redundant basic components on the Division I and II Emergency Diesel Generator Engines, the postulated failure could reduce the degree of protection provided to public health and safety.

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

Mississippi Power & Light received information of the deficiency on March 11, 1985

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

There are four 3 inch check valves utilized in each Division I and II Emergency Diesel Generator Engine on Unit 1 and 2 for a total of 16 check valves. However, the Unit 2 check valves have been utilized as interim replacements on Unit 1.

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

Unit 1

Material Nonconformance Report MNCR #149-85 has been issued to document the failure. An initial failure analysis revealed that the failure was due to low and high cycle fatigue. As a precautionary measure, air start header check valves on both Diesel Generators were replaced. In addition, a 800 hour limit has been placed on the use of these valves as interim corrective action.

TDI has recommended in its LOCFR21 Report to the NRC dated April 10, 1985, the replacement of the existing check valves (Clow Williams-Hagar) with a TRW Mission Duo Check II as final corrective actions.

A design change has been initiated to replace the eight existing check valves on Division I and II with appropriate check valves that are suitable for the design conditions.

Unit 2

The eight Unit 2 check valves will be replaced with the same type check valves as Unit 1. The replacement of these valves will be tracked by Bechtel Management Corrective Action Report, MCAR-158.

B. Responsible Individual

J. B. Richard
Senior Vice President, Nuclear
Mississippi Power & Light Company

C. Length of Time to Complete Actions

Unit 1

Corrective actions will be completed prior to restart after the first refueling outage.

Unit 2

Unit 2 corrective actions will be scheduled for completion upon resumption of normal construction activities.

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, it has no advice to offer.

May 9, 1985

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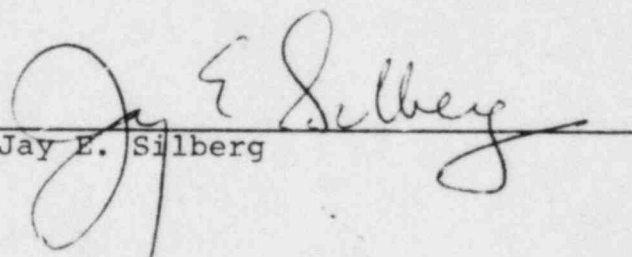
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
THE CLEVELAND ELECTRIC)
ILLUMINATING COMPANY)
)
(Perry Nuclear Power Plant,)
Units 1 and 2))

Docket Nos. 50-440
50-441

CERTIFICATE OF SERVICE

This is to certify that copies of the foregoing
"Applicants' Answer to OCRE Motion to Reopen Record on Issue
#16" were served by deposit in the United States Mail, first
class, postage prepaid, this 9th day of May 1985, to all those
on the attached Service List.


Jay E. Silberg

DATED: May 9, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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THE CLEVELAND ELECTRIC)	Docket Nos. 50-440
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Silver Spring, Maryland 20901

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