

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Catawba Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 4 1 1 3	PAGE (3) 1 OF 0 7
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TITLE (4)
Diesel Generator 1B Inoperable

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES		DOCKET NUMBER(S)
03	14	85	85	022	01	07	26	85			0 5 0 0 0
											0 5 0 0 0

OPERATING MODE (9) 1

POWER LEVEL (10) 0310

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §. (Check one or more of the following) (11)

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.406(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.406(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
<input type="checkbox"/> 20.406(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
<input type="checkbox"/> 20.406(a)(1)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
<input type="checkbox"/> 20.406(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.406(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME Roger W. Ouellette, Associate Engineer - Licensing	TELEPHONE NUMBER AREA CODE: 7104 31731-75310
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B	E K A N N	T 2 7 4		NO					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

From approximately 2200 hours on March 7, 1985, to approximately 1930 hours on March 14, 1985, Diesel Generator (D/G) 1B was inoperable due to a loss of DC control power. The problem was discovered on March 14, 1985, when an attempt to start Diesel Generator 1B resulted in the D/G not obtaining rated speed within the required time limit. After subsequent investigation, two circuit breakers for Diesel Generator 1B controls were found open. After the circuit breakers were closed, Diesel Generator 1B passed its operability test.

The cause of the incident was due to a Component Malfunction because when an Operator previously attempted to replace a burned out indicating light on the Diesel Engine 1B Panel, a short circuit occurred and tripped the two circuit breakers feeding Diesel Generator 1B controls. Procedural Deficiency was a contributing cause because a procedure did not exist to respond to the 1.47 Bypass Panel when a "D/G 1B Bypass" light actuated. Design Deficiency was another contributing cause because an annunciator was not available to warn of the loss of D/G 1B DC control power. Personnel Error was also a contributing cause because D/G 1B DC control power availability would have been ensured if the D/G Emergency Start Checklist was adhered to.

At the time of the incident, Unit 1 was in Mode 1 at 30% Reactor Power. This incident is reportable pursuant to 10 CFR 50.73, Section (a)(2)(i)(B).

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The Diesel Generators (D/G's) and associated controls, manufactured by TransAmerica Delaval Inc., provide a means to safely shutdown the plant by providing power to essential equipment in the event that the normal system power becomes unavailable. Technical Specification 3.8.1.1 provides guidance to ensure the D/G's are operable. Periodic Test PT/1/A/3250/02A(B) (D/G 1A (1B) Operability Test) is performed to comply with Technical Specification Surveillance Requirements 4.8.1.1.2a and 4.8.1.1.2b. Technical Specification 3.8.1.1 also provides the necessary action to take in the event a D/G is inoperable. This requirement is met by Periodic Test PT/1/A/4350/02C (Available Power Source Operability Check).

D/G DC control power is provided by the D/G batteries, or by the D/G battery chargers, which convert AC power to DC power. Several breakers are provided with this circuitry to serve as equipment protection from various system faults that could occur. An indicating light mounted on the Diesel Engine (D/E) panel provides the status of DC power to the control circuitry.

An Annunciator System, installed on each D/E panel, monitors the operation of the D/G's and alerts personnel of any malfunction by appropriate lights and audible alarms. When any annunciator on the panel alarms, a "D/G Panel Trouble" annunciator is actuated in the Control Room. The Control Room Operator will dispatch a Nuclear Equipment Operator (NEO) to the panel. Through the use of annunciator response procedures, necessary corrective action can be taken.

Another monitoring device for the D/G's is the 1.47 Bypass Panel. This system, which is designed in accordance with Regulatory Guide 1.47, alerts the Control Room Operator of a bypass (inoperable) status of a Nuclear Safety Related System Train. The light(s) that monitor the status of the D/G's are the "D/G A(B) Bypass" indication.

On March 7, 1985, at 1900 hours, Diesel Generator 1A was discovered to be inoperable due to its control power batteries being placed on equalize charge (see LER 413/85-18). D/G 1A batteries were subsequently returned to service at 1945 hours. Since D/G 1A had been inoperable, Periodic Test PT/1/A/4350/02C (Available Power Source Check) was required to be performed on D/G 1B to comply with Action Statement a of Technical Specification 3.8.1.1. Prior to performing PT/1/A/4350/02C, Nuclear Equipment Operator (NEO) A noticed that the "DC Control Power On" and the "Shutdown System Active" indicating lights on the Diesel Engine (D/E) Panel were not lit. He believed that the problem was caused by a burned out light bulb, and did not take action at that time to replace the bulb. From 1959 hours to 2005 hours, NEO A ran D/G 1B. D/G 1B met the Acceptance Criteria specified in PT/1/A/4350/02C. The same procedure was then performed on D/G 1A from 2323 hours to 2059 hours. D/G 1A met the Acceptance Criteria specified.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Upon completion of the procedures, the D/G's are required to be placed in alignment for Emergency Start (ES) Actuation. Prior to placing D/G 1B in ES alignment, NEO A obtained two light bulbs to replace the two lights that were burned out. A short circuit occurred when NEO A attempted to place the new bulb in the "DC Control Power On" socket at approximately 2200 hours. NEO A was unaware that breakers CB5 and CB6 (feeder breakers to D/E controls) located in the rear of D/E 1B panel had tripped. NEO A then proceeded to replace the burned out light bulb in the "Shutdown System Active" socket. However, the bulb would not light.

Per the ES checklist, the following step must be signed off: "17. D/C Control Power On (as indicated on D/E Control Panel 1B)". Since this light had caused a short circuit and was not functional at the time, NEO A contacted Unit Supervisors A and B so that he could obtain guidance as to the subsequent course of action. The Unit Supervisors instructed NEO A to use alternate means to verify that DC control power was available, i.e., check for acceptable D/G battery voltage, and verify D/G battery charger breakers were closed. They felt this was adequate, because they were under the belief that the "DC Control Power On" light was monitoring the status of the output voltage of the battery chargers. The Unit Supervisors were unaware that the breakers were connected downstream of the battery charger. After NEO A verified that the D/G battery had proper voltage and that the charger circuit breakers were closed, he signed off step 17 of the ES checklist. NEO B independently verified the step. Upon completion of the ES checklists for both D/G's, NEO A originated priority 2 Work Request 148590PS at 2335 hours to investigate and repair the light sockets for "DC Control Power On" and "Shutdown System Active".

On March 12, 1985, a Shift Technical Advisor (STA) noticed that the "D/G 1B Bypass" light on the 1.47 Bypass Panel was lit. The STA proceeded to research the applicable logic diagram to find the cause of the light being lit. After checking all the inputs to the light, he could not determine the problem. Priority 2 Work Request 149150PS was generated the next day to investigate and repair all the 1.47 Bypass lights that Control Room Personnel believed were incorrectly lit for present plant conditions.

On March 14, 1985, at 1250 hours, D/G 1A was started by NEO's C and D per PT/1/A/4350/02A (D/G 1A Operability Test) to meet Technical Specification Surveillance Requirements 4.8.1.1.2a and 4.8.1.1.2b. After approximately 40 minutes of operation, an annunciator for "Fuel Pump/Overspeed Drive Failure" was received. Fuel oil pressure began to decrease and the D/G began to vibrate excessively. As a result, D/G 1A was shutdown and declared inoperable. Work Requeste 149850PS was initiated to investigate and repair the cause of the problem.

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Since D/G 1A was inoperable, D/G 1B was required to be started to comply with Action Statement a of Technical Specification 3.8.1.1 using PT/1/A/4350/02C. At 1410 hours, NEO C attempted to place D/G 1B in Maintenance Mode. (This allows the D/G to be manually rolled on starting air prior to starting.) However, the Maintenance Mode relay would not latch in. Because of the Technical Specification requirement to prove D/G 1B operable when D/G 1A is inoperable, the Shift Supervisor instructed NEO C to run D/G 1B without manually rolling it on starting air. By procedure, the start attempt was made from the Control Room. D/G 1B began to roll, but it would not start due to the run relays apparently not energizing. When NEO C saw that the start timer was at 44 seconds, he phoned the Control Room and requested that D/G 1B be shutdown. However, when the NCO attempted to shutdown D/G 1B, D/G 1B continued to roll on starting air. (Starting air will stay engaged until the D/G starts.) Control of D/G 1B was then transferred to the diesel room so that a local attempt could be made to defeat the D/G start. This attempt failed. After approximately 100 seconds of rolling on starting air, D/G 1B started. However, the Generator Field did not flash, i.e., the Generator did not produce voltage. NEO C again tried unsuccessfully to stop the D/G with the stop pushbutton. Since D/G 1B would not shutdown by normal means, NEO C depressed the run/stop knob located on the diesel governor, successfully shutting down the D/G.

Since D/G's 1A and 1B were both inoperable, and the Main Generator was off line, an Unusual Event was declared at 1430 hours. At 1456 hours, the cause of the D/G 1A Fuel Oil System problem was investigated per Work Request 149850PS. The only problem with the D/G 1A Fuel Oil System was that its filters and strainers needed to be swapped. Since NEO's C and D recalled not having a high differential pressure (DP) indication across the filters when running D/G 1A, the DP gauge on the D/E panel was investigated for a possible malfunction. It was found that the equalize valve on the gauge was open, causing the gauge to give no indication of fuel oil filter DP. The local strainer DP gauge had not been checked either because it was not apparent that it was also clogged. Therefore, NEO's C and D had no reason to believe that the fuel oil filters and strainers needed to be swapped. After the gauge was valved in properly and the fuel oil filters and strainers were swapped, D/G 1A was run again per PT/1/A/4350/02A. Since no further problems were encountered, D/G 1A was declared operable, and the Unusual Event was secured at 1700 hours. An unsuccessful attempt was made to determine why the equalize valve on the filter DP gauge was left open.

At the same time D/G 1A cause of failure was investigated, D/G 1B cause of failure was being investigated per Work Request 149900PS. At 1726 hours, it was found that breakers CB5 and CB6 in the rear of D/E 1B Control Panel were open. These breakers feed the D/G run relays, the stop solenoid, and the maintenance mode lockout solenoid. Since the breakers were open, D/G 1B could not be placed in the maintenance mode nor could it be stopped by normal means. Even though the run relays did not energize, D/G 1B started after 100 seconds because the D/G exhausted most of its starting air pressure in an attempt to start. This caused the diesel shutdown solenoid to disarm, which resulted in the subsequent opening of the fuel racks and the start of the D/G. However, as a result of the run relays not energizing, the Generator Field did not flash, and therefore, prevented the Generator from producing voltage.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

After the breakers were closed, D/G 1B was started per PT/1/A/4350/02C to prove its operability. After the D/G ran satisfactory for approximately two hours, it was shutdown and declared operable.

On March 15, 1985, the investigation was continued to determine how the breakers were opened. On this day, a Staff Engineer discovered that Work Request 148590PS had been initiated on March 7, 1985, which was the previous time that D/G 1B was proven operable. After researching the electrical schematics, it was found that the "DC Control Power On" light was electrically protected by circuit breakers CB5 and CB6. The "DC Control Power On" socket was then removed. Inside the socket there was a dirt buildup. After cleaning the socket, it was reinstalled and a new light bulb was inserted. The light bulb then lit. When a dirt buildup in the socket occurred, an electrical arc was initiated when NEO A tried to replace the bulb. The arc was believed to have caused the breaker to trip.

This incident is classified as a Component Malfunction. The dirt buildup inside the "DC Control Power On" light socket caused an electrical arc when NEO A was replacing the bulb. It is possible that during the construction phase of Unit 1, the light lens cover was not present, thus allowing dirt to accumulate.

Although the cause of the incident was determined to be a component malfunction, another significant aspect of the incident was the length of time taken to discover it. When breakers CB5 and CB6 opened, a "D/G 1B Bypass" light actuated on the 1.47 Bypass Panel. However, no one noticed this light because an audible alarm did not sound. The panel had several alarms that Control Room personnel believed were incorrect for plant conditions. For this reason, Control Room personnel did not utilize the 1.47 Bypass Panel. When the actuated light was noticed by the STA five days after it had been lit, the cause of the light actuation could not be determined. This was due to the fact that procedures on the use of the 1.47 Bypass Panel have not been developed. Therefore, Control Room personnel were unaware of the response required for a light actuation. Thus, a contributing cause of Procedural Deficiency has been assigned to this incident. The STA also thought the alarm was spurious since the light was cleared on March 29, 1985 (the next time the STA was on duty.)

There are twelve inputs to the "D/G 1B Bypass" light. Five of the inputs to the "D/G 1B Bypass" lights are enabled by actuation of an annunciator on D/E 1B panel. The actuation of six of the inputs are monitored by breaker and valve positions which can be seen very easily from other Control Room indications.

One input to the light is 125VDC D/G Essential Auxiliary Trouble, which signifies that DC power to the D/G control circuitry is lost. For this input, there is no annunciator or other Control Room indication that there is trouble. There is an annunciator with this same nomenclature, but it does not monitor the position of the breakers in the rear of D/E 1B panel and is not an input to the 1.47 Bypass Panel. Therefore, when breakers CB5 and CB6 tripped, it was not readily apparent that a problem existed. An annunciator for the breaker positions should have been installed on all D/E panels. Therefore, a contributing cause of Design Deficiency has been assigned.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Another problem contributing to the failure to discover the open breakers was that no one on shift at the time was aware that the breakers existed. If the Unit Supervisors and NEO's had known about the breakers and their functional use, they would have likely met the intent of step 17 in the ES checklist differently. However, when the personnel involved attempted to meet the intent of this procedure step by alternate means, Operations Management Procedure (OMP) 1-4 was violated. Per OMP 1-4, no deviation from the original procedure shall be allowed without an approved procedure change. OMP 1-5 (Independent Verification) was violated when the step was verified complete, although it was not performed as written. Violation of these OMP's are classified as Personnel Errors. A similar problem as this, described in LER 413/84-04, occurred when a procedure change should have been made to allow alternate means to verify Unit Vent Flow Rate.

CORRECTIVE ACTION

- 1) When D/G 1B was discovered to be inoperable, an investigation was begun to determine the cause of its inoperability.
- 2) Breakers CB5 and CB6 were closed.
- 3) D/G 1B was proven operable per PT/1/A/4350/02C.
- 4) "DC Control Power On" socket was repaired, and its light bulb was replaced.
- 5) It was determined that a short circuit could cause breakers CB5 and CB6 to trip as determined by a test performed on Unit 2 D/E B Control Panel.
- 6) A Station Problem Report was initiated to install an annunciator to warn of loss of DC Control Power to the D/E Panel.
- 7) A Nuclear Station Modification was initiated to install an annunciator to warn of loss of DC Control Power to the D/E Panel.
- 8) Personnel repaired the 1.47 Bypass Panel invalid indications.
- 9) A generic response manual was developed to provide the action to take in the event a 1.47 Bypass Light actuates. Also, a section was added to Operation Management Procedure 2-31 (Control Room Annunciator Status) to ensure corrective actions on outstanding alarms are documented.
- 10) A statement will be added to the Diesel Generator Lesson Plan to ensure that personnel are aware that breakers exist in the rear of the D/E control panel and that their functional use is understood.
- 11) An Operator Update will be issued to instruct the appropriate personnel on the proper use of procedures.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

SAFETY ANALYSIS

While both D/G's were considered to be technically inoperable during this incident, subsequent evaluation indicated that D/G 1A would have started, loaded, and supplied power to its associated essential bus for a finite period. This was proven on March 14, 1985, when D/G 1A was started, loaded, and run for 40 minutes prior to developing a fuel oil filter clogging problem. Thus, D/G 1A was available to supply power to Auxiliary Feedwater (CA) Pump 1A for approximately 40 minutes during this incident.

D/G 1B started after approximately 100 seconds at 1410 hours on March 14, 1985. However, D/G 1B would not have provided power to its essential bus due to the inability of the generator field to flash.

From 2200 hours on March 7, 1985, to 1300 hours on March 13, 1984, D/G 2B and CA Pump #1 (see LER 413/85-21) were inoperable concurrently. During this period, D/G 1A would have started, loaded, and run for a period, as described previously.

In the event that a loss of off-site power had occurred, a reactor trip and Main Feedwater isolation would have occurred. Assuming that neither D/G had started on blackout, feedwater addition to the Steam Generators (S/G's) would have ceased. Existing water inventories in the S/G's would have been sufficient to remove decay heat for at least 25 minutes at 100% Power and longer at 30% Power. As Unit 1 was in Initial Startup Testing, decay heat present at this time would have been less than that following extended power operations. After this period, restoration of a source of AC power to either CA Pump would have had to occur to ensure adequate feedwater supply for continued decay heat removal.

Further, the Standby Makeup Pump, powered from the Standby Shutdown Facility, was available to supply Reactor Coolant Pump Seal Injection flow until normal sources were restored. This would have maintained integrity of those seals.

During these incidents, off-site power was continuously available, with no abnormal conditions existing with respect to the Station's tie to the off-site grid. Thus, both redundant sources of off-site power were operable and either source was capable of supplying required power to maintain the plant in a safe shutdown condition, including removal of decay heat.

The health and safety of the public were not affected by this incident.

DUKE POWER COMPANY

P.O. BOX 33189
CHARLOTTE, N.C. 28242

HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

TELEPHONE
(704) 373-4531

July 29, 1985

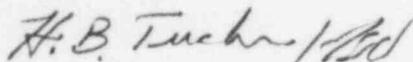
Document Control Desk
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Washington, D. C. 20555

Subject: Catawba Nuclear Station, Unit 1
Docket No. 50-413

Gentlemen:

Pursuant to 10 CFR 50.73 Section (a) (1) and (d), attached is Revision 1 to Licensee Event Report 413/85-22 concerning the inoperability of Diesel Generator 1B. This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,



Hal B. Tucker

RWO:slb

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

American Nuclear Insurers
c/o Dottie Sherman, ANI Library
The Exchange, Suite 245
270 Farmington Avenue
Farmington, CT 06032

Palmetto Alliance
2135½ Devine Street
Columbia, South Carolina 29205

M&M Nuclear Consultants
1221 Avenue of the Americas
New York, New York 10020

Mr. Jesse L. Riley
Carolina Environmental Study Group
854 Henley Place
Charlotte, North Carolina 28207

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, Georgia 30339

Robert Guild, Esq.
P. O. Box 12097
Charleston, South Carolina 29412

NRC Resident Inspector
Catawba Nuclear Station

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