

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Catawba Nuclear Station, Unit 2										DOCKET NUMBER (2) 0 5 0 0 0 4 1 4				PAGE (3) 1 OF 0 8									
TITLE (4) Diesel Generators Rendered Inoperable In Violation Of Technical Specification Because Retests Were Missed Due To Personnel Error																							
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 N/A				DOCKET NUMBER(S)										
1	2	2	1	8	7	8	7	0	3	1	0	0	0	1	2	0	8	8	0	5	0	0	0
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §. (Check one or more of the following) (11)																					
1		20.402(b)				20.405(c)				50.73(a)(2)(iv)				73.71(b)									
POWER LEVEL (10)		20.405(a)(1)(i)				50.38(e)(1)				50.73(a)(2)(v)				73.71(e)									
0 6 1 5		20.405(a)(1)(ii)				50.38(e)(2)				50.73(a)(2)(vi)				OTHER (Specify in Abstract below and in Text, NRC Form 306A)									
		20.405(a)(1)(iii)				50.73(a)(2)(i)				50.73(a)(2)(viii)(A)													
		20.405(a)(1)(iv)				50.73(a)(2)(ii)				50.73(a)(2)(viii)(B)													
		20.405(a)(1)(v)				50.73(a)(2)(iii)				50.73(a)(2)(ix)													
LICENSEE CONTACT FOR THIS LER (12)																							
NAME Julio G. Torre, Associate Engineer - Licensing										TELEPHONE NUMBER 71 014 3 7131-1810 219													
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																							
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC				
0	D/G	V	C	Y																			
SUPPLEMENTAL REPORT EXPECTED (14)																							
YES (If yes, complete EXPECTED SUBMISSION DATE)														X		NO		EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR	

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

On December 21, 1987, at 1600 hours while performing maintenance on Diesel Generator (D/G) 2A, Duke Power personnel discovered that D/G 2B Starting Air (VG) Inlet valves had been repaired on November 19, 1987 and that no performance (PRF) retest had been conducted contrary to Technical Specifications. Subsequent review of work history for all D/G VG Inlet valves revealed a total of six instances of missed retests following maintenance (all on the Unit 2 D/Gs) between July 11, 1986 and December 21, 1987. Unit 2 was operating at 65% power at the time of discovery and it had been in all modes except Mode 6, Refueling, with D/G Inlet valves being unknowingly technically inoperable. As a result, D/G 2A was technically inoperable between August 24, 1987 and December 21, 1987 and D/G 2B was technically inoperable between November 19, 1987 and December 21, 1987. The operability of D/G 2A was verified by 38 starts and the operability of D/G 2B was verified by 13 starts during the respective intervals. The action statements of Technical Specification 3.8.1.1 were not entered. The D/G 2B PRF retest was satisfactorily completed on December 21, 1987 at 1050 hours, and the D/G 2A PRF retest was satisfactorily completed by 1812 hours. This incident is attributed to personnel errors because the responsible individuals did not adequately review the Pump and Valve Inservice Inspection Program manual as required by Station Directives. The incident was reviewed with all appropriate personnel. Offsite power was available at all times. Both D/Gs would have been capable of starting if required as it was demonstrated by the frequent operability tests performed. The health and safety of the public were unaffected by this incident.

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BACKGROUND:

The Diesel Generator (EIIS:AB) (D/G) Starting Air (VG) System provides fast start capability for the Diesel Engines by using high pressure air to roll the D/G until it starts. It also provides a source of compressed air for the engine control panel instrumentation.

Each D/G engine is provided with two redundant starting air systems, each consisting of a compressor (EIIS:COMP) and aftercooler (EIIS:CLR), a filter/dryer (EIIS:FLT/DRY) unit, an air receiver (EIIS:RCV), injection lines and valves (EIIS:V), and devices to crank the engine. Two VG air receiver tanks (EIIS:TNK) per D/G provide sufficient capacity for a minimum of five successive engine starts without the use of the air compressors.

Starting air is supplied to the D/G engine by four starting air inlet valves, with each valve supplying starting air to one end of the two starting air manifold banks on the engine. The starting air enters the left and right bank starting air manifolds which are interconnected and designed to allow the capability of one or all of the starting air inlet valves to start the engine. From there, the starting air is directed to the individual cylinders by starting air distributors which admit air in firing sequence to rotate the engine until combustion begins and the engine accelerates under its own power. The combined starting air manifold also supplies air to the governor oil pressure boost cylinder to ensure the diesel attains rated speed within 11 seconds after receiving an automatic diesel start signal. If the receiver tank pressure drops below 150 psig, a lockout will prevent further automatic start attempts and an alarm is provided to alert the operator for corrective action. The automatic lockout insures there will be sufficient reserve for a manual restart.

There are two Emergency D/Gs per Unit to supply emergency standby power to the 4160 VAC Essential Auxiliary Power System (EIIS:EK). The D/Gs are each rated for continuous operation at 5750 KW. Each D/G is designed to attain rated voltage and frequency and to accept load within 11 seconds after receipt of a start signal.

Technical Specification 3.8.1.1 requires that two physically independent circuits between the offsite transmission network and the onsite Essential Auxiliary Power System, and two separate and independent D/Gs be operable in Mode 1, Power Operation, Mode 2, Startup, Mode 3, Hot Standby, and Mode 4, Hot Shutdown. With fewer than the above specified power sources operable, Unit operation may continue for a specified time which is dependant upon the equipment that is inoperable. Certain actions may be required such as, if one D/G is inoperable offsite power operability must be periodically demonstrated and; unless the D/G inoperability was due to preplanned maintenance or testing, demonstrate the operability of the remaining D/G within 24 hours.

Testing of 2VG25, 26, 27, and 28 (D/G 2A VG Inlet valves) and 2VG69, 70, 71, and 72 (D/G 2B VG Inlet valves) is required under ASME Code, Section XI, Subsection IWV. Catawba is committed to adherence to this Code in Technical Specification 4.0.5.a. The surveillance testing requirements are covered in the Valve

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Inservice Testing Program, in which periodic tests are conducted on valves in accordance with Catawba's Valve Inservice Testing Commitments.

In addition to periodic testing requirements, Subsection IWV requires that when a valve or its control system has been replaced or repaired or has undergone maintenance that could affect its performance, prior to being returned to service, it shall be tested to demonstrate that its performance parameters are within acceptable limits. Maintenance Planners are directed by Maintenance Management Procedure 1.0 and Station Directive 3.2.2 to determine retest requirements following maintenance on valves by referring to the Pump and Valve Inservice Testing Program manual.

Following maintenance on the D/G VG Inlet valves a functional verification is required. MM performs the functional verification by applying system pressure to the valve following reassembly, and observing for leakage. An OPS retest is also required, which consists of rolling the engine at rated speed with both banks of VG, and verifying that the VG Inlet valves close by the absence of air escaping from the VG inlet manifold blowdown ports. The required PRF retest involves isolating one bank of VG at a time, and verifying that the D/G will start in under 11 seconds with just one bank of VG in service. Each bank of VG is tested separately. This test does not verify operation of each VG Inlet valve, it tests the combination of the two VG Inlet valves on each bank. Design of the system does not permit testing of individual VG Inlet valves.

The operability of each D/G is demonstrated periodically by a test in which the D/G is started and loaded to rated capacity. The acceptance criteria include starting and reaching rated speed, output frequency and voltage within 11 seconds, and continuing to operate fully loaded for at least one hour. The frequency of testing is based upon the previous test history of the D/Gs.

DESCRIPTION ON INCIDENT:

On June 27, 1986, an Operations (OPS) Engineer originated Work Request (WR) 33373 OPS to repair 2VG69, Diesel Generator (D/G) 2B Starting Air (VG) Inlet valve. The valve was leaking past the seat causing the associated VG compressor to operate excessively. On July 1, 1986, Mechanical Maintenance (MM) Planner A received the WR to plan the work. During the planning process, Planner A incorrectly specified that only a functional verification was required following the work. On July 8, 1986, MM Technicians repaired the valve by replacing the internals. Following reassembly, on July 9, 1986, at 0900 hours, the valve was functionally verified by pressurizing the system and verifying that no leakage existed as was specified by the Planner. Since no OPS and Performance (PRF) retests were conducted, 2VG69 was technically inoperable upon completion of this WR. This rendered the right bank of VG on D/G 2B technically inoperable. However the left bank of VG was still operable, leaving D/G 2B operable. The operability of D/G 2B was verified by the completion of PT/2/A/4350/02B, D/G 2B

Operability Test, by OPS on July 11, 1986, at 0924 hours. On October 27, 1986, PRF personnel conducted PT/2/A/4350/16B, VG System 2B Full Stroke Verification Test, following Nuclear Station Modification work on D/G 2B. This test also

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unknowingly satisfied the retest requirement for WR 33373 OPS and ended the technical inoperability of 2VG69.

On January 19, 1987, an OPS Engineer originated WR 35520 OPS to repair 2VG28, D/G 2A VG Inlet valve, due to it sticking open following a start of the D/G. On January 21, 1987, MM Planner B received the WR to plan the work. During the planning process, the planner correctly specified that a functional verification and both an OPS and PRF retest were required upon completion of the work. MM Technicians disassembled and cleaned the valve, replaced the disc o-rings, and reassembled the valve. The valve was functionally verified and OPS retested at 1500 hours. However, no PRF retest was conducted because a PRF Engineer incorrectly waived the retest requirement. This decision rendered 2VG28 technically inoperable. This rendered the left bank of VG on D/G 2A technically inoperable. However, the right bank of VG was still operable, which ensured operability of D/G 2A. The operability of D/G 2A was verified by the completion of PT/2/A/4350/02A, D/G 2A Operability Test, by OPS on January 29, 1987, at 1045 hours.

On August 21, 1987, an OPS Engineer originated WRs 37905 OPS and 37907 OPS to repair 2VG26 and 2VG25 respectively, D/G 2A VG Inlet valves, due to their leaking past the seat. When MM Planner B planned the WRs, he specified that a functional verification and OPS retest were required upon job completion (no PRF retest was specified). MM Technicians disassembled and cleaned the valves, replaced the valve o-rings, and reassembled the valves. On August 22, 1987, at 1530 hours, the valves were functionally verified and OPS retested. The valves and both banks of VG were technically inoperable since no PRF retest was conducted. This rendered D/G 2A technically inoperable. The appropriate D/G Technical Specification action statements were not entered. However, the operability of D/G 2A was verified by the performance of PT/2/A/4350/02A by OPS at 1630 hours.

On November 8, 1987, an OPS Engineer originated WR 38532 to repair 2VG69, 70, 71, and 72, D/G 2B VG Inlet valves, due to one of the valves occasionally sticking open during air rolls on the engine. On November 12, 1987, MM Planner B received the WR to plan the work. During the planning process, the Planner again incorrectly specified that only a functional verification and OPS retest were required following the work. On November 18, 1987, MM Technicians disassembled and cleaned the valves, replaced the o-rings and then reassembled the valves. The valves were functionally verified and OPS retested at 0900 hours. Since no PRF retest was performed, all four VG Inlet valves and therefore, both banks of VG for D/G 2B were technically inoperable. This resulted in D/G 2B being technically inoperable. The appropriate D/G Technical Specification action statements were not entered. The operability of D/G 2B was demonstrated upon completion of PT/2/A/4350/02B by OPS on December 9, 1987, at 1226 hours.

On December 2, 1987, an OPS Engineer originated WR 38843 OPS to repair 2VG26 and/or 2VG28, D/G 2A VG Inlet valves, due to one of the valves sticking open occasionally during air rolls of the engine. When MM Planner B planned the WR, he incorrectly specified that only a functional verification and OPS retest were required after the repairs were performed. On December 3, 1987, MM Technicians disassembled and cleaned the valves, replaced the poppet on 2VG26, and then

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reassembled both valves. The valves were functionally verified and OPS retested at 1400 hours. Since no PRF retest was conducted, the left bank of VG remained technically inoperable. The right bank of VG was already technically inoperable. Therefore, D/G 2A remained technically inoperable at this time. The appropriate D/G Technical Specification action statements were not entered. The operability of D/G 2A was verified upon completion of PT/2/A/4350/02A by OPS on December 16, 1987, at 1830 hours.

On December 16, 1987, an OPS Engineer originated WR 38980 OPS to repair 2VG25 and/or 2VG27, D/G 2A VG Inlet valves, due to one valve sticking open occasionally. On December 18, 1987, MM Planner C planned the WR and specified that a functional verification and PRF retest were required upon work completion. (No OPS retest was specified.) On December 21, 1987, MM Technicians disassembled the valves and discovered the valve poppets and o-rings to be "badly gummed up" with Dow Corning 111. They contacted a MM Engineer who changed the procedure to allow the use of Vaseline instead of the Dow lubricant. The Technicians cleaned the valve internals, installed new o-rings, lubricated the o-rings with Vaseline, and reassembled the valves. At approximately 1530 hours, the MM Supervisor contacted a PRF Engineer to verify the PRF retest requirement and to arrange for the retest if necessary. The PRF Engineer was not certain of the retest requirements for the valves but agreed to check and call the MM Supervisor back. During this time, the MM Supervisor and an OPS Engineer discussed the reason for the delay. The OPS Engineer informed the MM Supervisor that PRF had not conducted a retest following VG Inlet valve maintenance before and that D/G 2B's VG Inlet valves had been worked on recently. When the PRF Engineer called the MM Supervisor back and verified the retest was necessary, the MM Supervisor informed him of what the OPS Engineer had said. Based upon that information, the PRF Engineer contacted the OPS Shift Supervisor who declared D/G 2B inoperable at 1600 hours.

At 1650 hours, D/G 2B was declared operable after successful completion of PT/2/A/4350/16B by PRF personnel. By 1812 hours, 2VG25 and 2VG27 were functionally verified and D/G 2A was retested by OPS and PRF personnel utilizing PT/2/A/4350/16A, VG System 2A Full Stroke Verification Test. Following completion of these retests, the technical inoperability of both D/Gs and their associated VG Systems was ended.

CONCLUSION:

This incident is attributed to a personnel error. Four of the missed retests resulted when a Construction and Maintenance Department (CMD) Planner (on loan to Nuclear Production Department (NPD) MM Planning) specified only an OPS retest on the WR. The Planner stated that he made the error because he confused the abbreviation for OPS and PRF retest (O/P) with the abbreviation for OPS retest (OPS) in the Pump and Valve Inservice Inspection manual when making the retest determination. Another retest was not conducted after maintenance when a PRF Engineer incorrectly waived the PRF retest which was called for on the WR. The PRF Engineer stated that he may have also confused the abbreviation O/P for OPS in the manual when he made his determination that no PRF retest was required.

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The first retest was missed when another CMD Planner (also on loan to NPD MM Planning) specified that only a functional verification was necessary after the valve work. Discussion with the Planner did not positively identify the reason for his incorrect retest determination. However, he had not been in the position long at that time and felt that he could have just forgotten to check the manual. In each instance, the individuals involved failed to adequately review the Pump and Valve Inservice Inspection Program manual when making retest determinations as required by Station Directive. All three personnel were aware of this requirement and routinely utilize the manual in their work.

This incident has been reviewed with appropriate personnel with proper procedure compliance and attention to detail stressed. Additionally, all Maintenance Planners have been reminded to use the available documentation and to pay attention to detail when making retest determinations.

The Catawba Compliance section is pursuing a Technical Specification Interpretation to more clearly define operability concerns following maintenance on D/G VG Inlet valves.

There have been four previous incidents involving missed retests due to personnel errors (see LER 413/85-38, LER 414/86-05, LER 413/86-32, and LER 413/87-22). The corrective actions associated with these similar incidents involved reemphasizing the importance of using available documentation to make retest determinations with the individuals responsible for the errors. None of the personnel involved in this event were involved in the previous incidents. Therefore, the corrective actions taken could not have prevented this incident. This is considered to be a recurring type of event.

A search of the Nuclear Plant Reliability Data System (NPRDS) revealed 32 applications of Calcon Model 3618 Solenoid actuated valves. There are three reported failures, all of which involved leakage past the seat on Catawba D/G 2A VG Inlet valves. Some of the WRs identified in this report have yet to be entered into NPRDS since they are still in the review process. The repairs made to these valves are NPRDS reportable. The failure mode appears to be dirt or particulate contamination deposited on the valve internals.

CORRECTIVE ACTION:

IMMEDIATE

D/G 2B was declared inoperable.

SUBSEQUENT

- (1) PRF retested D/G 2B VG Inlet valves.
- (2) D/G 2B declared operable.
- (3) D/G 2A VG Inlet valves were functionally verified and both OPS and PRF retests completed, ending D/G 2A's VG System inoperability.

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- (4) This incident has been reviewed with the individuals involved. Procedure adherence and attention to detail were stressed.
- (5) All Maintenance Planners have been reminded to utilize the available documentation and to pay attention to detail when making retest determinations.

PLANNED

A Technical Specification Interpretation which clarifies D/G operability concerns following maintenance on D/G VG Inlet valves will be completed.

SAFETY ANALYSIS:

From July 8, 1986, to October 27, 1986, one bank of VG on D/G 2B was technically inoperable following maintenance on one of the four VG Inlet valves without a retest being performed. However, during this time the operability of D/G 2A was verified by 26 starts, all of which were valid successes, and D/G 2B's operability was verified by 25 starts, all of which were also valid successes. Neither D/G experienced a valid failure to start, and offsite power was continuously available during this period. When D/G 2B was retested on October 27, 1986, the test was successful, indicating that the D/G would have started if required during this time.

Between January 19, 1987, and December 21, 1987, each bank of VG on D/G 2A became technically inoperable periodically after PRF retests were missed following maintenance. All four VG Inlet valves were repaired at least once during this period. The operability of D/G 2A was verified by 38 starts, all of which were valid successes, and no valid failures to start occurred within that time frame. D/G 2A was technically inoperable between August 22, 1987, and December 21, 1987, when both banks of VG were simultaneously technically inoperable since required retests had not been performed. Between November 19, 1987, and December 21, 1987, D/G 2B was technically inoperable for the same reason. From January 19, 1987, to December 21, 1987, the operability of D/G 2B was verified by 13 starts, all of which were valid successes, and no valid failures to start occurred. Additionally, offsite power was available at all times.

Due to the redundant design of the D/Gs VG Systems, the designed capability of one out of four of the VG Inlet valves to start a D/G, and the frequent operability testing performed, there is no reason to believe that both D/Gs would not have started if required.

The purpose for the PRF retest is to verify that one VG train is capable of starting the D/G within 11 seconds as designed. The retest ensures that one or both VG Inlet valves on a single VG bank are opening sufficiently to start the D/G in the required time. In each case, subsequent PRF retests verified the ability of each bank of VG for both D/Gs to start the D/G in less than 11 seconds. Additionally, there have been no reported failures of these valves to open.

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This incident is reportable pursuant to 10 CFR 50.73, Section (a)(2)(i)(B).

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

DUKE POWER COMPANY

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HAL B. TUCKER
VICE PRESIDENT
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January 20, 1988

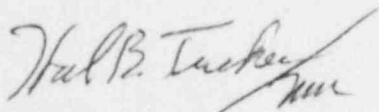
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U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Catawba Nuclear Station, Unit 2
Docket No. 50-414
LER 414/87-31

Gentlemen:

Pursuant to 10 CFR 50.73 Section (a) (1) and (d), attached is Licensee Event Report 414/87-31 concerning Unit 2 Diesel Generators rendered inoperable in violation of Technical Specifications because retests were missed due to personnel errors. 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

JGT/1257/sbn

Attachment

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