



DUKE POWER

September 3, 1996

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: Catawba Nuclear Station
Docket No. 50-413
LER 413/96-003

Gentlemen:

Attached is Licensee Event Report **Technical Specification 3.0.3 Required Shutdown Due to Ventilation System Motor Failures.**

This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

W. R. McCollum, Jr.

Attachment

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LICENSEE EVENT REPORT (LER)

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TITLE (4)
Technical Specification 3.0.3 Required Shutdown Due to Ventilation System Motor Failures

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 NAME	DOCKET NUMBER(S)
08	02	96	96	- 03	- 00	09	03	96	N/A	05000

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more of the following) (11)									
POWER LEVEL 10) 100	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)						
	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)						
	20.405(a)(1)(ii)	50.36(c)(2)	X 50.73(a)(2)(vii)	OTHER (Specify in						
	20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	Abstract below and						
	20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	in Text, NRC Form						
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	366A)						

LICENSEE CONTACT FOR THIS LER (12)

NAME D. P. Kimball, Safety Review Group Manager	TELEPHONE NUMBER AREA CODE (803) 831-3743
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS
F	VI	MO	R165	No					
F	VF	MO	R165	No					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (if yes, complete EXPECTED SUBMISSION DATE) X NO							

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

Unit Status: Unit 2 was in Mode 1, Power Operation, at 100 percent power.

Event Description: On August 2, 1996, at 2356 hours the Control Room Area Ventilation (VC) system A train pressurizing fan tripped. Technical Specification (T/S) 3.0.3 was entered since B train VC was inoperable due to preplanned maintenance. On August 4, 1996, at 0443 hours, with the unit in Mode 4, Hot Shutdown, the 2A Auxiliary Building Ventilation (VA) system filtered exhaust fan tripped. The 2B VA system was inoperable at the time for carbon bed replacement. T/S 3.0.3 was entered for both trains of VA being inoperable and the unit was placed in Mode 5, Cold Shutdown, per T/S.

Root Cause: The root causes of both events are attributed to equipment failure. The VC train A pressurizing train fan motor and the 2A VA filtered exhaust fan motor experienced a ground fault within a single phase of the three phase stator winding.

Corrective Action: The damaged motors were replaced. Testing of the 2B VC pressurizing fan motor was performed and test data for the other VA filtered exhaust motors were reviewed. Planned corrective action includes additional failure analysis of the motors by the motor vendor. The results of this analysis will be evaluated by Engineering to determine if further action is necessary.

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

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BACKGROUND

The Control Room Area Ventilation [EIIS:VI] (VC) system and the Control Area Chilled Water [EIIS:KM] (YC) system work in conjunction to provide the normal and emergency ventilation requirements to the control room [EIIS:NA] and control room area. The VC/YC system is shared between Units 1 and 2 and consists of two redundant trains, A and B.

The design basis function of the combined VC/YC system is to:

- Ensure that the control room will remain habitable for Operations personnel during and following all credible accident conditions; and
- ensure that the ambient air temperature does not exceed the allowable temperature for continuous duty rating for the equipment and instrumentation cooled by this system.

This function is accomplished by pressurizing the control room to greater than or equal to 1/8 inch water gauge with respect to all surrounding areas, filtering the outside air used for pressurization, filtering a portion of the return air from the control room to clean up the control room environment, and by maintaining the control room temperature less than 90 degrees Fahrenheit.

Per Technical Specification (T/S) 3.7.6, two independent Control Room Area Ventilation systems shall be operable. This requirement is applicable in all modes of operations. In operational modes 1, Power Operation, 2, Startup, 3, Hot Standby, and 4, Hot Shutdown, action statement 3.7.6.a states that with one control room ventilation system inoperable for reasons other than the heaters [EIIS:HTR] tested in 4.7.6.b and 4.7.6.e.4, restore the inoperable system to operable status within 7 days or be in at least hot standby within the next six hours and in cold shutdown within the following 30 hours.

The Auxiliary Building Ventilation [EIIS:VF] (VA) system provides clean outside air to the Auxiliary Building. Two redundant trains, A and B, are provided per unit. The design basis of the VA system is to ensure that the Emergency Core Cooling System (ECCS) pump [EIIS:P] rooms are maintained at a negative pressure when in the ECCS alignment. The VA filtered exhaust system will ensure that all radioactive material released from the ECCS pump rooms is filtered through the system's HEPA filters [EIIS:FLT] and activated carbon adsorbers prior to discharge to the atmosphere.

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Per T/S 3.7.7, two independent trains of the auxiliary building filtered exhaust shall be operable in modes 1-4. Action statement 3.7.7.a states that with one train of VA inoperable for reasons other than the heaters specified in 4.7.7.a and 4.7.7.d.5, restore the inoperable train to operable status within 7 days or be in at least hot standby within the next six hours and in cold shutdown within the following 30 hours.

Technical Specification 3.0.3 is required to be entered when a unit is operating in a condition prohibited by Technical Specifications. It exists when a Limiting Condition for Operation (LCO) is not met except as provided in the associated action requirements. It requires that within one hour action shall be initiated to place the unit in a mode in which the specification does not apply by placing the unit, as applicable, in:

- At least hot standby in the next 6 hours,
- At least hot shutdown within the following 6 hours, and
- At least cold shutdown within the subsequent 24 hours.

EVENT DESCRIPTION

- VC/YC Entry into T/S 3.0.3 and Subsequent Unit 2 Shutdown

July 31, 1996

2030 hours

Unit 2 VC/YC B train declared inoperable to perform preplanned maintenance.

August 2, 1996

2356 hours

The breaker [EIIS:52] for VC A train pressurizing filter fan [EIIS:FAN] motor [EIIS:MO] tripped open. Unit 2 entered T/S 3.0.3 due to both trains of VC/YC being inoperable.

August 3, 1996

0200 hours

Unit 2 shutdown commenced.

Insulation resistance testing of the VC A train pressurizing filter fan motor was performed. The results of this test were not conclusive; parallel effort for motor and breaker replacement was begun.

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0624 hours Unit 2 entered Mode 3, hot standby.

1022 hours The breaker for VC A train pressurizing filter fan motor is replaced. The breaker tripped immediately upon system restart. Maintenance troubleshooting indicated that the fan motor has failed.

1209 hours Unit 2 entered Mode 4, hot shutdown.

August 4, 1996

1248 hours Unit 2 entered Mode 5, cold shutdown.

1526 hours Installation of the spare VC A train pressurizing filter fan motor is complete.

1700 hours VC A train pressurizing filter fan motor placed in service.

August 5, 1996

1700 hours VC/YC B train declared operable.

August 6, 1996

0200 hours VC/YC A train declared operable.

• VA System Entry into T/S 3.0.3

July 29, 1996

2000 hours 2A VA declared inoperable due to filtered exhaust low flow. This was identified during performance of PT/0/A/4450/01C, VA Filtered Exhaust Filter Train Performance Test, on 2B VA.

July 30, 1996

1700 hours Following revisions to the applicable procedures, Operations Test Group personnel balanced the discharge flow between 2A and 2B filtered exhaust fans.

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2310 hours

2A VA fails PT/0/A/4450/01C. Pre-filter and HEPA filter change out commenced to improve pressure differential.

July 31, 1996

0600 hours

Pre-filter and HEPA filter replacement for 2A VA filtered exhaust train completed.

1130 hours

Performance testing per PT/0/A/4450/01C demonstrated acceptable flow balance between A and B trains of Unit 2 VA.

1500 hours

2A HEPA filter bypass flow is 0.08 percent. Technical Specifications allows 0.05 percent. Maintenance is performed to reduce bypass flow.

1845 hours

PT/0/A/4450/01C is performed. Bypass leakage is 0.0 percent. All parameters are acceptable and 2A VA is declared operable.

August 1, 1996

1600 hours

PT/0/A/4450/01C is performed to measure the carbon bed bypass flow for 2B VA filtered exhaust train. Test acceptance criteria is not met. 2B VA is declared inoperable.

August 2, 1996

1426 hours

2B VA carbon bed vibration in progress. Bypass damper verified to be closed.

August 3, 1996

0200 hours

Unit 2 shutdown commenced per the requirements of T/S 3.0.3 due to both trains of VC/YC being inoperable.

0624 hours

Unit 2 entered Mode 3, hot standby.

1209 hours

Unit 2 entered Mode 4, hot shutdown.

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1558 hours Carbon added to the 2B VA filtered exhaust train.
August 4, 1996

0330 hours 2B VA filtered exhaust failed PT/0/A/4450/01C.

0412 hours Determination made to replace the carbon bed and HEPA filters in 2B VA filtered exhaust.

0443 hours VA filtered exhaust fan 2A motor tripped. Unit 2 entered T/S 3.0.3 for both trains of VA being inoperable.

0601 hours Insulation resistance testing indicated that the filtered exhaust fan motor was shorted. Replacement of the fan motor commenced.

1248 hours Unit 2 entered Mode 5, cold shutdown.
August 5, 1996

2305 hours 2A VA declared operable.

August 8, 1996

1800 hours 2B VA declared operable.

CONCLUSION

The Failure Investigation Process (FIP) was initiated by Engineering to investigate the root cause of the VC/YC and VA fan motor failures and determine if any commonalities existed. The root cause of both events described in this Licensee Event Report (LER) are attributed to equipment failure.

- VC A Train Pressurizing Filter Fan Motor Failure

The conclusion from the FIP team was that the failure of the VC A train pressurizing filter fan motor was attributed to a ground fault within a single phase of the 3-phase stator winding system.

Corrective action included the replacement of the VC A pressurizing filter fan motor and testing of the train B motor to ensure adequate operating

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condition. Planned corrective action includes sending the fan motor to the motor vendor for additional failure analysis.

Failure of the VC A train pressurizing filter fan motor is not NPRDS reportable.

- 2A VA Filtered Exhaust Fan Motor Failure

The conclusion of the FIP team was that the failure of the 2A VA filtered exhaust fan motor was attributed to a ground fault within a single phase of the 3-phase winding system. The magnitude of the fault affected a second phase.

Corrective action included replacement of the 2A VA filtered exhaust fan motor, evaluation of the test data from other ventilation systems to ensure operable status of the carbon beds, and review of test data from the other VA motors. Planned corrective action includes sending the fan motor to the motor vendor for additional failure analysis.

Failure of the VA filtered exhaust fan motor is not NPRDS reportable.

- Operating Experience Review

A review of the Operating Experience database for the two years prior to these events revealed no similar, reportable events associated with ventilation units or failed motors. This event is not considered recurring per the guidance provided in procedure SRG 3.2, Licensee Event Reports.

However, equipment trending performed by Engineering, indicates that an adverse trend exists with respect to station motors. This trend is documented in Problem Investigation Process (PIP) 0-C96-1723 and includes VA and VC system motors. This trend was documented on July 10, 1996. Engineering is performing a root cause evaluation of this trend and will develop corrective actions based on this analysis.

CORRECTIVE ACTION

SUBSEQUENT

- 1) Unit 2 was shut down to Mode 5 per the requirements of T/S 3.0.3.
- 2) VC/YC train A pressurizing fan motor was replaced.

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- 3) VC/YC train B pressurizing fan motor was successfully tested to ensure adequate operating parameters. The A and B train motors have been in service since unit startup; this testing was to ensure that there was not an age related concern.
- 4) 2A VA filtered exhaust fan motor was replaced.
- 5) Test data from other ventilation systems was reviewed to ensure operable status of the carbon beds.
- 6) Test data from the other VA motors was reviewed/compared to the test data from the 2A VA filtered exhaust fan motor. There was no data to indicate motor problems.

PLANNED

- 1) The damaged VC/YC train A pressurizing fan motor will be returned to the motor vendor for additional failure analysis.
- 2) The damaged 2A VA filtered exhaust fan motor will be returned to the motor vendor for additional failure analysis.
- 3) Engineering will evaluate the results of the vendor's failure analysis and determine if further action is necessary.

SAFETY ANALYSIS

As noted in this LER, at 2356 hours on August 2, 1996, A train of the VC pressurizing filter train tripped due to failure of the fan motor. In accordance with Technical Specification 3.0.3 an orderly shutdown of Unit 2 was commenced. Unit 1 was in a refueling outage at this time and in No Mode, defueled, thus was not affected by this event.

Control room cooling was available throughout this event. Reactor Coolant [EIIS:AB] (NC) system iodine levels were negligible due to operation in the current fuel cycle with no known fuel defects. All fuel handling activities, though none were in progress or planned, were placed on hold on both units to eliminate the risk of a fuel handling accident. Any activities involving the transportation of chlorine on site were placed on hold to reduce the risk of a chlorine release.

The control room ventilation system pressure boundary was not breached for removal of the VC A train pressurizing filter fan motor until approximately

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1000 hours on August 3, 1996. At this time the NC system pressure was approximately 1400 psig. At this pressure the risk of a significant failure of the NC system piping is significantly reduced due to lower stress levels in the piping. Until this time the control room pressure boundary was maintained, which due to its low leakage construction, provided significant protection to the control room Operators from the consequences of a design basis accident and would have allowed sufficient time for implementation of additional compensatory measures to provide additional protection for the Operators.

The failure of the VC A train control room pressurizing filter fan motor and the unavailability of the train B VC/YC pressurizing fan due to preplanned maintenance activities had no impact on off-site doses.

The failure of the 2A VA filtered exhaust fan motor, and resulting T/S 3.0.3 entry due to both trains of VA being inoperable, occurred during the shutdown of Unit 2 to Mode 5. Unit 2 was in mode 4 at the time with NC system pressure of approximately 340 psig and NC system temperature above the low temperature overpressure protection limit. At these pressures and temperatures, the risk of a significant failure of the NC system piping is significantly reduced due to lower stress levels in the piping.

Therefore, the health and safety of the public were not affected by this event.