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A Duke Energy Company

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February 21, 2000

U. S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Duke Energy Corporation
Catawba Nuclear Station Unit 1
Docket No. 50-413
Licensee Event Report 413/99-015 Revision 1

Attached please find Licensee Event Report 413/99-015 Revision 1, entitled "Inoperability of Auxiliary Building Ventilation System in Excess of Technical Specification Limits Due to Improperly Positioned Vortex Damper".

The only commitments in this Licensee Event Report are those described in the "Planned Corrective Actions" section. Questions regarding this Licensee Event Report should be directed to R. D. Hart at (803) 831-3622.

Sincerely,

G. R. Peterson

Attachment

IE22

xc:

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NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(6-1998)

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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TITLE (4)

Inoperability of Auxiliary Building Ventilation System in Excess of Technical Specification Limits Due to Improperly Positioned Vortex Damper

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL	REVISION	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									NA	
06	16	99	99	015	01	02	21	00	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	1
POWER LEVEL (10)	100 %

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)	50.73(a)(2)(v)	
	20.2203(a)(2)(iv)	X	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
R. D. Hart, Regulatory Compliance	(803)-831-3622

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO	N/A			

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On August 2, 1999, during surveillance testing, it was discovered that the Auxiliary Building Filtered Ventilation Exhaust System (ABFVES) Train 1A was not maintaining the Emergency Core Cooling System pump rooms at a negative pressure relative to adjacent areas as required by Technical Specifications (TS). The cause of the event was that a vortex damper had been incorrectly reassembled following maintenance on June 16, 1999. On August 26, 1999, it was concluded that ABFVES Train 1A had been inoperable since that time. In addition, a review determined that ABFVES train 1B was inoperable on 4 separate occasions during this time frame. These events exceed the TS Required Action Time. This event was reportable per 10 CFR 50.73(a)(2)(i). The damper was repositioned correctly, the system was retested successfully, and the system was restored to operable status on August 5, 1999. The root cause of this event was inadequate procedural guidance in the procedure used to lubricate the vortex damper. A contributing cause was a failure to require a post maintenance retest. A new procedure was developed and approved to provide detailed instructions for vortex damper positioning. The Post Maintenance Retest Manual has been revised to require a retest of the system after maintenance on the vortex damper. An evaluation has determined that this event did not pose a threat to the health and safety of the public.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

Background

On August 2, 1999, during surveillance testing, it was discovered that the Auxiliary Building Filtered Ventilation Exhaust System (ABFVES) Train 1A was not maintaining the Emergency Core Cooling System (ECCS) pump rooms at a negative pressure relative to adjacent areas as required by Technical Specifications (TS). Subsequent investigation revealed that a vortex damper had been incorrectly reassembled following maintenance on June 16, 1999. On August 26, 1999, it was concluded that the incorrectly assembled vortex damper rendered ABFVES Train 1A inoperable. Therefore, 1A ABFVES had been inoperable from June 15, 1999 until August 5, 1999. During the this time frame ABFVES Train 1B was taken out of service four (4) times for various maintenance activities. This resulted in both trains of ABFVES being inoperable at the same time on 4 separate occasions.

TS Limiting Condition for Operation (LCO) 3.7.12 governs the ABFVES. The LCO requires that two ABFVES trains be Operable during Mode 1, Power Operation, Mode 2, Startup, Mode 3, Hot Standby, and Mode 4, Hot Shutdown. The Required Action with one train inoperable is to restore the train to operable status within 7 days or place the Unit in cold shutdown within 36 hours. No Required Action is specified for both trains being inoperable. Therefore, the events described above resulted in Unit 1 being in TS 3.0.3. This is a condition prohibited by TS and is reportable per 10 CFR 50.73 (a)(2)(i).

Each unit at Catawba Nuclear Station is a Westinghouse pressurized water reactor. The Catawba units share a common auxiliary building [EIIS: NF], which houses the nuclear steam supply auxiliary equipment, electrical equipment, control room [EIIS: NA], and related piping and cabling.

The Auxiliary Building Filtered Exhaust System [EIIS System: VF] filters air exhausted from potentially contaminated areas of the auxiliary building, including the ECCS pump rooms and non-safety portions of the auxiliary building. In the ECCS alignment, the system consists of two independent and redundant trains for each unit. Each train of the system consists of the necessary heater/demister [EIIS Component: HTR], filter package [EIIS Component: FLT], fans [EIIS Component: FAN], dampers [EIIS Component: DMP], and ductwork [EIIS Component: DUCT]. Following receipt of a safety injection signal, the non-safety portions of the system are isolated and air is exhausted from the ECCS pump rooms through the filters.

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Vortex dampers provide throttled flow during Loss of Coolant Accident (LOCA) operation. One vortex damper is located at the inlet of each filtered exhaust fan. The vortex damper is in the full open position during normal operation. When the system is in the ECCS alignment, the vortex damper goes to the throttled position.

Surveillance Requirement (SR) 3.7.12.4 states, "Verify one ABFVES train can maintain the ECCS pump rooms at negative pressure relative to adjacent areas" at a frequency of 18 months on a staggered test basis.

At Catawba, the ECCS consists of the high head centrifugal charging system [EIIS system: CB], the intermediate head safety injection system [EIIS System: BQ], and the low head residual heat removal system [EIIS System: BP]. Additionally the ABFVES draws a negative pressure on the Containment Spray pump rooms.

Event Description

June 15, 1999

ABFVES train 1A was taken out of service for preventive maintenance on System Vortex Damper 1ABFD-13 at 0400. This maintenance involved removal of the faceplate (gear retainer disc) to allow cleaning and lubrication of the Vortex Damper gear drives. The gear drive mechanism was removed to ensure that imbedded dirt could be removed and gears could be lubricated. The maintenance was performed in accordance with maintenance procedure MP/0/A/7450/019, Clarage Type AFP 1550A Series Fans Corrective Maintenance. Per procedural requirements, the as found position of the actuator arm to damper was match marked prior to removal. Lubrication was completed and the gear drive was replaced with the vortex damper blades in the fully open position. During re-assembly, the damper blade position was not checked. There were no procedural requirements to check the blade position. In the as-left condition, the gear drive mechanism caused the vortex damper to go to an almost closed position when placed in the LOCA alignment. The vortex damper should have gone to a throttled position with the damper blades partially open. With the damper blades in the wrong position airflow was reduced from the ECCS pump rooms. The reduced exhaust prevented ABFVES Train 1A from maintaining some of the ECCS Pump rooms at a negative pressure relative to the adjoining areas. This was not known by Operations at that time and ABFVES train 1A was placed back in operation and considered operable.

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June 29, 1999

The ABFVES train 1B was taken out of service at 0400 for carbon sample and inspection and returned to service at 1806.

July 22, 1999

ABFVES train 1B was taken out of service at 1025 for inspection of the turning vane and returned to service at 1615.

July 27, 1999

ABFVES train 1B was taken out of service at 0400 because the 1B DG was taken out of service for maintenance and inspection. ABFVES train 1B was returned to service at 0732 after the power supply on 2EMXH was shifted to Unit 2.

July 27, 1999

ABFVES train 1B was taken out of service at 0940 for carbon sampling and returned to service at 1744.

August 2, 1999

1315 hours

Surveillance testing per TS 3.7.12.4 was completed for ABFVES train 1A. There was not an indication that ABFVES train 1A fan (ABFXF-1A) was operating, and it was physically verified to be running. Testing indicated that the Residual Heat Removal 1A and 1B pump rooms, the Safety Injection 1B pump room, and that Centrifugal Charging 1A pump room were not at a negative pressure relative to adjacent areas. ABFVES train 1A was declared inoperable and a log entry was made in the Technical Specification Action Item Log (TSAIL).

August 3, 1999

Engineering evaluated this failure and completed system walk down inspections to find potential sources of blockage within the ABFVES ductwork or potential open dampers that could allow air to be drawn into the filtered exhaust fan thereby reducing air exhausted from the ECCS Pump Rooms.

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August 4, 1999

ABFVES train 1A Inlet Vortex Damper 1ABFD-13 was found in the almost closed position. A Work Order was written to adjust the linkage between the actuator and the vortex damper and to position the vortex damper properly.

August 5, 1999

ABFVES train 1A was tested per PT/0/A/4450/04A, Auxiliary Building Filtered Exhaust System Performance Test. This testing demonstrated that the ABFVES train 1A now met the requirements of TS 3.7.12.4. ABFVES train 1A was declared operable.

ABFVES trains 1B, 2A and 2B were also tested per PT/0/A/4450/04A to ensure that each of these trains was capable of maintaining the ECCS pump rooms at a negative pressure per TS Surveillance Requirement 3.7.12.4. The tests were completed successfully.

August 26, 1999

An evaluation was completed to determine operability of the ABFVES during the time that the vortex damper was incorrectly assembled. The evaluation concluded that the system had been inoperable between June 15, 1999 and August 5, 1999, which was in excess of the TS Required Action Time.

Causal Factors

A root cause analysis was performed for this event. This analysis determined that this event occurred due to inadequate maintenance procedure guidance. The maintenance procedure MP/0/A/7450/019, Clarage Type AFP 1550A Series Fans Corrective Maintenance, is utilized to lubricate the ABFVES vortex dampers.

This procedure did not provide adequate guidance to ensure that vortex damper blades are returned to the correct position (for normal operation and for a LOCA alignment) following maintenance. The procedure used match marks to realign vortex damper position, but the match mark alignment process is not accurate enough to adequately realign the dampers. The vortex damper position was not checked for either the normal or LOCA alignment to ensure vortex damper blades were in the correct position.

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The procedure did not ensure that the vortex damper actuator stroke length was correct to ensure the damper was correctly positioned for operation in both the LOCA and the normal alignment. The procedure should identify steps to ensure the vortex damper is correctly positioned to ensure damper linkage will move freely through the penetration hole into the fan housing.

The analysis also identified a major contributing factor to be that performance of a post maintenance retest was not required upon completion of the maintenance. A retest would have provided an independent check of the maintenance completed to ensure the system was ready to be restored to operable status.

The Problem Investigation Process Database was queried for occurrences within the past two years of TS noncompliance caused by inadequate procedures and/or inadequate retest following maintenance. Licensee Event Report 413/1998-012-01, Technical Specification 3.0.3 Entry Due to Inoperability of Both Trains of Control Room Ventilation Caused by Improper System Isolation, describes a previous event. In this event, a system was inoperable in excess of TS requirements due to improper component positioning attributable to inadequate procedures and training on the method for proper positioning.

LER 413/1998-003, Omission in Retest Manual Leads to Failure to Perform Required Retest Prior to Restoring Containment Isolation Valves to Service, and LER 413/1999-009-01, Inoperability of Containment Valve Injection Water System Valve in Excess of Technical Specification Limits Due to Inadequate Retest Following a Surveillance Test Failure, describe previous events. In these events, a system was inoperable in excess of the TS Allowed Outage Time due to inadequate testing prior to returning a component to service. Based on the third event of this type, inadequate testing prior to returning a component to service is a recurring problem requiring additional focus.

Corrective Actions

Immediate

1. ABFVES train 1A was declared inoperable.

2. System walkdown inspections were initiated to identify the reason for the surveillance test failure.

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Subsequent

1. A Work Order was completed to adjust the linkage and to position the Vortex Damper correctly. A post maintenance retest per procedure PT/0/A/4450/04A was then completed. The retest showed that ABFVES train 1A was maintaining the ECCS pump rooms at a negative pressure relative to the adjoining areas. ABFVES train 1A was declared operable.

2. ABFVES trains 1B, 2A and 2B were also tested per PT/0/A/4450/04A to ensure that each of these trains was capable of maintaining the ECCS pump rooms at a negative pressure per TS Surveillance Requirement 3.7.12.4.

3. Predefined Maintenance work order models were revised to ensure that a post maintenance retest is completed following maintenance on the ABFVES vortex dampers.

4. Maintenance Procedures MP/0/A/7450/019, Clarage Type AFP 1550A Series Fans Corrective Maintenance, MP/0/A/7450/083, ITT Hydramotor Model NH 95 Actuator Corrective Maintenance and MP/O/A/7450/048, Temporary Alteration of Station Dampers, were placed on hold until planned changes were implemented.

5. The Post Maintenance Retest Manual has been revised to ensure that following work on ABFVES vortex damper(s) a Post Maintenance Retest is completed.

6. A new maintenance procedure MP/0/A/7450/087, Vortex Damper Alignment, was created to provide guidance for lubrication and adjustment of ABFVES vortex dampers. The new procedure also provides instructions to ensure that the vortex damper is properly positioned for both the normal and LOCA alignment. This corrective action replaces the planned corrective actions of revising maintenance procedures MP/0/A/7450/019, MP/0/A/7450/083, & MP/0/A/7450/048 as described in revision 0 of this LER.

Planned

1. An assessment will be conducted to determine if inadequate testing prior to returning a component to service is a generic issue and whether further corrective actions are necessary.

Safety Analysis

The safety function of the ABFVES is to exhaust air from the ECCS pump rooms after a LOCA. The air would be filtered and released to the environment. The ABFVES is designed to draw a negative pressure in the ECCS pump rooms to ensure that leakage from pump seals is filtered prior to being released from the unit vent. The ECCS pump rooms include the following rooms:

Room	Elevation
Centrifugal Charging Pump Rooms (NV)	543
Safety Injection Pump Rooms (NI)	543
Residual Heat Removal Pump Rooms (ND)	522
Containment Spray Pump Rooms (NS)	522

The following is a description of the areas adjacent to each set of the rooms.

NV Pump Rooms - 560 general area, 543 general area, hallway to the NI and reciprocating charging pump rooms, the 543 mechanical penetration room, NS pump rooms, and pipe chase around 522 pump rooms.

NI Pump Rooms - 560 general area, 543 general area, hallway to the NI and reciprocating charging pump rooms, 543 mechanical penetration room, ND pump rooms, reciprocating charging pump room, duct shaft open at 522 elevation, and pipe chase around 522 pump rooms.

ND Pump Rooms - 543 general area, hallway to the ND Pump Rooms, hallway to the NI and reciprocating charging pump rooms, NI pump rooms, and pipe chase around 522 pump rooms.

NS Pump Rooms - 543 general area, 522 general area, NV pump rooms, and pipe chase around 522 pump rooms.

There are two of each of these rooms associated with each unit. Each of these rooms contains one train-related pump and may have penetrations in the floor or walls. The penetrations may have pipe, instrument tubing or cables running through them. Each of these penetrations has been sealed with fire stop foam to enhance the pressure boundary associated with the rooms. The foam provides a barrier that is basically airtight and is capable of resisting any pressure difference that may be generated by the ventilation system. The integrity of these foam barriers was verified by Engineering walkdown on January 31, 2000.

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The only penetration in the ceiling of each room is an equipment access hatch that is provided for the easy removal and replacement of the pump and motor or other heavy equipment located in the room. The equipment hatches stay in place during Modes 1 through 4 to preserve the room pressure boundary. The equipment hatches are not sealed but have been taped to minimize debris collection in the crevices around the hatch plugs. As a result the only unsealed openings into the rooms are the doorways into the rooms and the equipment hatches that are taped but not sealed.

TS require that the ECCS pump rooms be demonstrated negative with respect to adjacent areas on an 18-month frequency. During this test the doorway and equipment hatch is smoke tested to ensure the room is at a negative pressure. Additionally, a negative differential pressure is verified using a differential pressure device (typically an air data multi-meter) to verify the negative pressure across the walls or floors that are not demonstrated to be at a negative pressure by the smoke test.

The ABFVES is designed so that a safety injection signal on either unit will align both units train related components into the ECCS alignment. In other words a 1A Safety Injection Signal will align both the 1A and 2A trains into the ECCS alignment. The same is also true for B train and Unit 2 A and B Train signals.

The performance capabilities of the Unit 1 and Unit 2 ABFVES filters are identical. TS require the Unit 2 filters to be tested to a much more restrictive in place leakage criteria than the Unit 1 filters. Unit 1 is tested to $\leq$ 1% and Unit 2 is tested to $\leq$ 0.05% in place penetration. The dose analysis treats all four filters (1A, 1B, 2A and 2B) as equal.

On August 2, 1999 a routine 18-month surveillance test was being conducted on the 1A ABFVES. The 1B and 2B trains were shutdown and the 1A and 2A trains were in the ECCS alignment. The 1A train was declared inoperable due to an inability to maintain some of the ECCS pump rooms at a negative pressure. Flow measurements taken on the duct from the ECCS pump rooms revealed that total flows out of this area were approximately 1000 cfm. As will be demonstrated by the following discussion, this flow rate was adequate to ensure that the ECCS Pump Rooms were negative with respect to all general areas except the 522 elevation general area. Normal flow rates out of this area typically were about 4500 cfm.

On the 522 elevation the ND and NS pump rooms were not negative with respect to the 522 general area. The 522 general area was verified to be negative with respect to the pipe chase that surrounds this area.

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Additionally, troubleshooting verified that the 522 elevation was negative with respect to the 543 elevation. Given this information it is clear that the 2A train was keeping this area negative preventing any unfiltered release.

On the 543 elevation the NV 1A pump room was negative with respect to all areas except the Mechanical Penetration Room. NI Pump Room 1B was negative with respect to all areas except the PD Pump Room. Since all penetrations in these walls are sealed with fire stop there is no leakage path. Without a leakage path no unfiltered release could have occurred even though a negative pressure could not be demonstrated. It should also be noted that rooms were also not "pressurized." The differential pressure recorded for these rooms was approximately 0.0003 and 0.0004 inches water gage respectively. This basically should be considered a zero differential pressure. Therefore, there is no driving force to move any airborne radioactive products of ECCS leakage out of these rooms.

Total measured ECCS leakage during the time the damper was incorrectly set up was less than 1/10th of the non-filtered leakage assumed in the dose analysis.

The ABFVES provides accident mitigation to support 10 CFR 100 and GDC 19. The dose analysis assumes 1 gpm of leakage in these pump rooms and 0.3 gpm of leakage outside the pump rooms. The leakage assumptions are that any leakage inside the pump rooms is filtered by the ABFVES while any leakage outside the pump rooms is released to the environment without any holdup or filtration.

The GDC19 and 10CFR100 analysis were not affected by this event for two reasons:

First total leakage was actually less than 1/10th of the non-filtered leakage amount assumed in the dose analysis. Therefore, even if all of the ECCS leakage was considered to be non-filtered, the existing Dose Analysis remains bounding for the event.

Second, there was no credible leak path from the pump rooms on the 543 elevation to either the Mechanical Penetration Room or the Reciprocating Charging Pump Room. Leakage out of the Unit 1 ND and NS Pump Rooms was demonstrated to be captured by the Unit 2 ABFVES. During the time the damper was set incorrectly both units were in Modes 1 through 4. A review of the TSAIL indicated that ABFVES train 2A was taken out of service 2 times and train 2B was taken out of service 4 times during this period.

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At no time was train 2A and 2B taken out of service at the same time. Therefore, at least one ABFVES was Operable on Unit 2. The pressure boundaries associated with the pump rooms are maintained at all times in Modes 1 through 4, therefore the data taken on August 2 and 3, 1999 are applicable to the entire time the damper was set incorrectly.

The effects on potential operator actions in the Auxiliary Building were reviewed. Only leakage in the ND and NS Pump Rooms could have migrated from Unit 1 to Unit 2. This potential leakage migration path would have been contained on the 522 elevation. Therefore, no ECCS pump room leakage would have migrated through the general areas on any elevation other than the 522 elevation. There are no required post accident operator actions on the 522 elevation of the Auxiliary Building. Therefore, no required operator action in the Auxiliary Building was affected by this event.

Based on the above discussion, this event did not pose a threat to the health and safety of the public or the capability to take appropriate mitigating actions under post accident conditions in the Auxiliary Building.