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A Duke Energy Company

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January 13, 2000

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
Licensee Event Report 50-287/1999-02, Revision 0
Problem Investigation Process No.: O-99-5041

Reference: Letter, LA Reyes (NRC-RII) to WR McCollum (Duke), Notice of Enforcement Discretion for Duke Energy Corporation Regarding Oconee Nuclear Station - Unit 3 (NOED No. 99-2-004), dated December 17, 1999

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 50-287/1999-02, concerning operation of Unit 3 with an inoperable reactor building cooling unit contrary to the requirements of Technical Specification (TS) 3.6.5. The violation of TS described in this report was in accordance with the NRC Notice of Enforcement Discretion referenced above.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(i)(B). 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

IE22

cc: Mr. Luis A. Reyes
Administrator, Region II
U.S. Nuclear Regulatory Commission
61 Forsyth Street, S. W., Suite 23T85
Atlanta, GA 30303

Mr. D. E. LaBarge
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

INPO Records Center
700 Galleria Parkway, NW
Atlanta, GA 30339-5957

Mr. M. C. Shannon
NRC Resident Inspector
Oconee Nuclear Station

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMD NO. 3150-0104
EXPIRES: 04/30/98
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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit 3	05000-287	1 of 7

TITLE (4) Violation of Technical Specification 3.6.5 Due to Failure of Reactor Building Cooling Unit - With NOED

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)
										05000
12	15	99	1999	- 02	- 00	1	13	00		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)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 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)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER	
L.E. Nicholson, Regulatory Compliance Manager	AREA CODE	(864) 885-3292

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
D1	RBC	FCU	J127	Yes					

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)

At approximately 18:30 on December 8, 1999, with Unit 3 in Mode 1 at approximately 100 percent power, Reactor Building Cooling Unit (RBCU) "B" was determined to be inoperable. At this time, Technical Specification (TS) 3.6.5, Required Action B.1 was entered that requires, in part, the RBCU be restored to Operability within 7 days. The cause of the failure could not be determined in sufficient time to complete the repairs within the allowed out-of-service time. Since it was safer to complete the repairs without unit shutdown, a Notice of Enforcement Discretion (NOED) was requested and received from the NRC on December 15, 1999.

Following RBCU repairs and testing, the RBCU was restored to Operability at approximately 17:27 on December 19, 1999, thereby exiting TS 3.6.5, Required Action B.1 and the NOED. The root cause of the failure was determined to be procedural technical deficiencies that resulted in inadequate assembly of the RBCU propeller to the motor shaft when the motor was replaced in September 1997. The procedural deficiencies have been corrected. Additionally, preventive and/or predictive monitoring of the RBCUs will be enhanced.

This event was of no significance to the health and safety of the public.

EVALUATION:

BACKGROUND

This LER reports operation of Unit 3 contrary to the Completion Time Requirement of Technical Specification (TS) 3.6.5, Reactor Building Spray and Cooling Systems, Required Action B.1 from 18:30 on December 15, 1999 until 17:27 on December 19, 1999. This operation was the subject of a NRC Notice of Enforcement Discretion (NOED). The NOED was verbally approved on December 15, 1999, as documented by NRC letter to Duke dated, December 17, 1999.

The Reactor Building Cooling Units (RBCU) [EIIS:BK] are one of two independent Engineered Safeguards Systems (ES) provided to remove heat from the Reactor Building (RB) atmosphere following an accident. The other system is the Reactor Building Spray (RBS) [EIIS:BEI] System.

The capacity of each of these systems is designed to remove heat from the RB to reduce pressure following a Loss Of Coolant Accident. During normal plant operation, RBCUs "A" and "C" operate in the high-speed mode to help cool the RB in conjunction with the Reactor Building Auxiliary Coolers. RBCU "B" is not typically operated during normal operation. During an emergency, the RBCU System mode of operation changes automatically. The ES System is activated when the RB pressure reaches 3 psig. Upon actuation, the fan motors associated with RBCUs "A" and "C" change from high to low speed and the fan motor associated with RBCU "B" is started at low speed. All three RBCUs then operate continuously to circulate the RB steam-air mixture past the cooling coils to transfer heat from the RB atmosphere to the Low Pressure Service Water System (LPSW) [EIIS:BI] which is supplied from Lake Keowee (the ultimate heat sink).

TS 3.6.5, requires, in part, that two RBS trains and three RBCUs be Operable in Modes 1 and 2. Should one of these five cooling systems be inoperable, it must be restored to Operability within 7 days per TS 3.6.5 Required Action B.1. If Required Action B.1 is not met, Condition D must be satisfied whose Required Action is to place the Unit in Mode 3 within the next 12 hours.

EVENT DESCRIPTION

During the time covered by this description of the event (December 7 through 19, 1999), Unit 3 operated in Mode 1 at approximately 100 percent power.

Indications of high RBCU "B" fan motor bearing temperatures were observed during routine RBCU cooler performance testing at high speed on December 7, 1999. The problem was entered into the Problem Investigation Process and engineering was contacted to perform an assessment. RBCU "B" was run at ES speed (low) and bearing temperatures were observed over the next 24 hours to be higher than normal, but within acceptable limits. On December 8, 1999, an inspection of RBCU "B" found one of the three upper fan motor mounting struts broken. RBCU "B" was promptly stopped and TS 3.6.5, Required Action B.1 was entered at 18:30.

A Failure Investigation Process (FIP) team was assembled and investigated the cause of the RBCU "B" failure, as well as the actions needed to restore the RBCU. The team's objective was to diagnose the as-found RBCU condition, including its various components. The FIP team and supporting personnel were organized into two shifts to provide continuous 24-hour a day coverage to minimize RBCU "B" unavailability.

As described above, initial inspection of the 3B RBCU identified that a motor strut (one of three) had broken and was lodged against the motor housing. One of the two bolts retaining the strut to the fan housing was found missing and later located on the RBCU cooling coil and is assumed to have loosened due to vibration: The other bolt had sheared. Subsequent metallurgical examinations concluded that the strut initially failed at the motor end due to a fatigue crack at a weld, then the bolting failed at the fan housing end due to low cycle fatigue. A replacement strut was fabricated and installed.

Following re-assembly of the motor supports, the propeller was observed rubbing on the fan housing. Further inspections revealed that the propeller was loose on the motor shaft, creating a possible source of vibration. Initial investigation indicated that

the problems could be resolved by tightening the fan hub on the motor shaft. This work was completed on December 13. Following this initial repair effort, testing results indicated these repair efforts did not reduce RBCU vibration to acceptable levels.

Concurrently, a review of significant indicators for the Unit 1 and 2 RBCUs, and the Unit 3 RBCUs "A" and "C" was performed and concluded that these eight RBCUs were operable. These indicators included bearing temperature trends, vibration alarm data, run time information, and performance testing. In addition, these RBCUs were visually and audibly assessed to determine their running condition. The RBCU motor struts and hangers were visually inspected: No significant problems were detected. Based on the above review of operational data and field observations, no operability concerns existed with these RBCUs. This conclusion is further supported by significantly greater run time of these RBCUs than Unit 3's RBCU "B".

On December 13, 1999, the FIP team identified the immediate cause of RBCU "B" failure and late on December 13, concluded that repair of the RBCU should include replacement of its motor and propeller. It was concluded the needed repairs could not be completed in the remaining TS 3.6.5 Completion Time. Consequently, the NRC was informed on December 14, 1999, that a NOED would be necessary. The NOED was requested and received from the NRC on December 15 1999, to allow completion of RBCU "B" repair with Unit 3 on line as that was the safest course of action.

At 17:27 on December 19, 1999, the NOED was exited after the RBCU "B" had been declared Operable following completion of repairs and Operability testing.

CAUSAL FACTORS

The root cause of this event was inadequate procedural technical guidance to ensure proper installation of the propeller to the motor shaft when the motor of RBCU "B" was replaced in September 1997. The fit of the propeller hub on the motor shaft is critical. The procedural

guidance provided by Maintenance Procedure MP/0/A/3009/007, Motor - Cooling Fan - Reactor Building - Removal and Replacement, did not address the fit of the propeller to the motor shaft.

CORRECTIVE ACTIONS

Immediate:

A FIP team was initiated to determine the cause of the RBCU "B" failure.

Subsequent:

1. As causal information was developed by the FIP team, the other Oconee RBCUs were checked and verified to be Operable. Some minor configuration deviations were identified and corrected. These deviations did not affect these RBCUs' Operability.

2. A comprehensive review and upgrade of Maintenance Procedure MP/0/A/3009/007 was performed prior to replacement of the RBCU "B" motor and propeller.

3. The RBCU "B" motor and fan were replaced. The RBCU was tested to verify Operability.

Planned:

Oconee will enhance the RBCU preventive and/or predictive monitoring program.

This LER does not contain a commitment to the NRC.

SAFETY ANALYSIS

Duke evaluated the capability of the available containment heat removal systems and components to meet the containment heat removal requirements for the conditions (containment and ultimate heat sink temperatures)

expected during the period of discretion. The primary role of the RBCUs is long term prevention of containment overpressurization.

A review of actual performance data of the Unit 3 RBCUs "A" and "C", collected on December 7, 1999, revealed that each RBCU individually had sufficient heat removal capacity to meet the design basis heat removal requirements for RBCUs. Assuming conservative initial values of 150F for the Reactor Building average temperature and 85F for LPSW cooling water to the RBCU cooling coils at the initiation of an event, the required heat removal capacity for the Unit 3 Reactor Building Cooling System was 54.4E6 BTU/Hr. The testing performed on December 7, 1999 demonstrated that the RBCU "A" and "C" combined heat removal capacity was 148.5E6 BTU/Hr. Each cooler individually has a capacity of 74.25E6 BTU/Hr. Therefore, assuming a single failure of either one of the two remaining coolers, there was 36.5% excess capacity. This analysis also demonstrated that post-LOCA equipment qualification temperature requirements are met.

The RBCU function is only weakly correlated to the large early release frequency (LERF). The LERF for Oconee is dominated by containment bypass sequences, in particular the interfacing system loss of coolant accidents, which are not affected by RBCU operation. Therefore, the impact on core damage frequency and containment performance, including LERF, was evaluated to be insignificant (i.e., < 1E-8/year).

It is therefore concluded this event was of no significance to the health and safety of the public.

ADDITIONAL INFORMATION

There were no releases, exposures, or injuries associated with the event.

The failure of the RBCU is considered reportable under the Equipment Performance and Information Exchange (EPIX) program. The RBCU is a Joy (manufacturer code J127), model 66-30-1170/585 (Series 2000 special). The NRC root cause code is D, a procedure Technical Deficiency, because Oconee maintenance procedure MP/0/A/3009/007 did not provide sufficient technical guidance to ensure proper assembly of the RBCU propeller to the motor shaft.

A review of reportable events indicated there have been no component failures within the past two years due to the root cause identified in this event.