ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8903020537 DOC.DATE: 89/02/22 NOTARIZED: NO DOCKET #
FACIL:50-287 Oconee Nuclear Station, Unit 3, Duke Power Co. 05000287
AUTH.NAME AUTHOR AFFILIATION
NORTH,P.J. Duke Power Co.
TUCKER,H.B. Duke Power Co.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 89-001-00:on 890111,unit shutdown due to degraded capabilities reactor bldg cooling units.

DISTRIBUTION CODE: IE22D COPIES RECEIVED:LTR 1 ENCL 1 W/8 ltr. SIZE: 10
TITLE: 50.73 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD2-3 LA	1	1	PD2-3 PD	1	1
	PASTIS,H	1	1			
INTERNAL:	ACRS MICHELSON	1	1	ACRS MOELLER	2	2
	ACRS WYLIE	1	1	AEOD/DOA	1	1
	AEOD/DSP/TPAB	1	1	AEOD/ROAB/DSP	2	2
	ARM/DCTS/DAB	1	1	DEDRO	1	1
	NRR/DEST/ADE 8H	1	1	NRR/DEST/ADS 7E	1	0
	NRR/DEST/CEB 8H	1	1	NRR/DEST/ESB 8D	1	1
	NRR/DEST/ICSB 7	1	1	NRR/DEST/MEB 9H	1	1
	NRR/DEST/MTB 9H	1	1	NRR/DEST/PSB 8D	1	1
	NRR/DEST/RSB 8E	1	1	NRR/DEST/SGB 8D	1	1
	NRR/DLPQ/HFB 10	1	1	NRR/DLPQ/QAB 10	1	1
	NRR/DOEA/EAB 11	1	1	NRR/DREP/RAB 10	1	1
	NRR/DREP/RPB 10	2	2	NRR/DRIS/SIB 9A	1	1
	NUDOCS-ABSTRACT	1	1	REG FILE 02	1	1
	RES/DSIR/EIB	1	1	RES/DSR/PRAB	1	1
	RGN2 FILE 01	1	1			
EXTERNAL:	EG&G WILLIAMS,S	4	4	FORD BLDG HOY,A	1	1
	H ST LOBBY WARD	1	1	LPDR	1	1
	NRC PDR	1	1	NSIC HARRIS,J	1	1
	NSIC MAYS,G	1	1			

NOTE TO ALL "RIDS" RECIPIENTS:

PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK, ROOM P1-37 (EXT. 20079) TO ELIMINATE YOUR NAME FROM DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

TOTAL NUMBER OF COPIES REQUIRED: LTTR 45 ENCL 44

RIDS/ADDS

RIDS/ADDS

A/04

cc

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit 3	0 5 0 0 0 2 8 7	1 OF 0 9

TITLE (4)
Unit Shutdown Due to Degraded Capabilities Reactor Building Cooling Units

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)
										0 5 0 0 0
0 1	1 2	8 9	8 9	0 0 1	0 0	0 2	2 2	8 9		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)			
	N	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	1 0 0	20.405(a)(1)(i)	50.36(c)(1)	X 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)	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
	AREA CODE
Philip J. North, Regulatory Compliance	7 0 4 3 7 3 - 7 4 5 6

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	

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)

On January 10, 1989, with Unit 3 at 100% full power, testing was performed on the "A" and "C" Reactor Building Cooling Units (RBCU's). The testing was done to verify the operability of the RBCU's and was in accordance with an earlier commitment by the ONS Performance Section to increase testing frequency on the RBCUs of all units due to previous fouling problems (See LER 287/88-03). The analysis of the data collected indicated service induced fouling of the RBCU's had reduced the performance capabilities of the coolers to unacceptable limits. As a result, at 0000 hours on January 12, the "A" and "C" RBCU's were declared inoperable. Immediate corrective action was to decrease Unit 3 Reactor Power and place the Unit in a hot shutdown condition in accordance with Technical Specification 3.3.5. Subsequnt corrective actions included cleaning of the RBCUs. The root cause of this incident was service induced fouling which resulted in the impaired cooling capability of the coolers. Therefore, the root cause of this incident is classified as Other, due to air side fouling of the RBCU's to a point at which they were inoperable.

IE22
1/1

INTRODUCTION

On January 10, 1989, with Unit 3 operating at 100% full power, testing was performed on the Unit 3 "A" and "C" Reactor Building Cooling Units (RBCU's). The testing was done to verify the operability of the RBCU's and was in accordance with an earlier commitment by the ONS Performance Section to increase testing frequency on the RBCUs of all units due to previous fouling problems (See LER 287/88-03). Data for the test was collected at the location of the fusible dropout plates which earlier had been removed by Mechanical Maintenance (See LER 269/89-03). The analysis of the data collected indicated service induced fouling of the RBCU's had reduced the performance capabilities of the coolers to unacceptable limits. Subsequent testing performed on the Unit 3 "A" and "C" RBCU's also indicated unacceptable performance. As a result, at 0000 hours on January 12, the "A" and "C" RBCU's were declared inoperable.

Immediate corrective action was to decrease Unit 3 Reactor Power and place the Unit in a hot shutdown condition in accordance with Technical Specification 3.3.5. Subsequent corrective actions included cleaning of the RBCUs.

This incident resulted because service induced fouling of the Unit 3 RBCU's resulted in the impaired cooling capability of the coolers. Therefore, the root cause of this incident is classified as Other, due to air side fouling of the RBCU's to a point at which they were inoperable.

SEQUENCE OF EVENTS

January 7, 1989
1800 — Unit 3 "A" and "C" Reactor Building Cooling Units (RBCU's) fusible dropout plates were removed.

January 10
1000 — "A" and "C" RBCUs were tested.
— Data was gathered at location where fusible dropout plates were removed.
— Analysis of data indicated unacceptable RBCU performance.

January 11
1000 — "A" and "C" RBCU's were retested.
— Data was gathered at the normal location (upstream of damper).
1500 — Analysis of data indicated unacceptable RBCU performance.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Oconee Nuclear Station, Unit 3	0 5 0 0 0 2 8 7	8 9	— 0 0 1	— 0 0	0 3 OF 0 9

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

January 11, 1989(continued)

1800 — Fusible dropout plates were reinstalled on "C" RBCU.
2100 — "C" RBCU was retested.
— Data was gathered at the normal location.

January 12

0000 — Analysis of data indicated the performance of "C" RBCU was degraded.
— "A" and "C" RBCU's were declared inoperable.
0050 — NRC was notified via red phone.
0310 — "B" RBCU was tested and verified operable.
0330 — Unit 3 Reactor Power decrease was begun.
— Preparations were begun to clean "C" RBCU.
0857 — Turbine/Generator was taken off line.
0953 — Unit was at hot shutdown.
1830 — Completed cleaning of "C" RBCU.

January 13

0345 — Assembly of "C" RBCU was completed.
— Preparations were begun to clean "A" RBCU.
0452 — "C" RBCU was tested.
— Data was gathered at the normal location.
0650 — Analysis indicated an increase in "C" RBCU capacity following cleaning.
1500 — Cleaning completed on "A" RBCU.
1900 — Maintenance Services (MS) requested lower coils in "A" RBCU be recleaned.
2145 — Recleaning of coils in "A" RBCU was completed.
2230 — MS decided to use drums to heat water to clean "A" RBCU coils.

January 14

0430 — Drums for heating water were placed in Reactor Building.
— "A" RBCU coils were cleaned using hot water.
0600 — Cleaning of coils on "A" RBCU was completed.
— MS inspected coils on "A" RBCU.
— Reassembly of "A" RBCU was begun.
1450 — Reassembly of "A" RBCU was completed.
1545 — "A" RBCU was tested.
— Data was gathered at the normal location.
1930 — Analysis indicated an increase in "A" RBCU capacity following cleaning.
— "A" and "C" RBCU's were declared operable.
2344 — Reactor was critical.

January 15

0758 — Turbine/generator was on line.
1933 — Reactor was at 100% full power.

BACKGROUND

The purpose of the Reactor Building Cooling System [EIIS:BK] is to remove heat from the containment atmosphere during normal and post accident plant operation. The system is located entirely in the Reactor Building (RB) [EIIS:NH] and consists of three Reactor Building Cooling Units (RBCU's) identified as "A", "B", "C". The system is an Engineered Safeguards (ES) [EIIS:JE] System.

RBCU's "A" and "C" operate in the high speed mode during normal plant operation. The coolers circulate air from the upper portion of the RB over cooling coils which utilize Low Pressure Service Water (LPSW) [EIIS:BI] as the cooling medium. The cool air is then distributed throughout the lower portion of the RB. Cooling Unit "B" is not operated during normal plant operation and the LPSW supplied to this cooler is diverted to the four RB auxiliary cooling units.

The Engineered Safeguard System (Channels 5 and 6) is activated when RB pressure reaches 3 psig. Upon actuation, the fan motors associated with the RBCUs "A" and "C" change to low speed and the fan motor associated with Unit "B" is energized at low speed. Also on Engineered Safeguards signal, the valves in the LPSW System which diverted water from the "B" RBCU to the RB auxiliary cooling units are realigned to allow LPSW to be supplied to Unit "B" cooling coil.

It has been determined through periodic testing that the RBCUs are susceptible to service induced fouling. This fouling is usually in the form of dust and boron collecting on the air side of the coolers; however, significant amounts of tube side fouling have been identified during previous inspections. Over a long period of service, fouling reduces the efficiency of the RBCUs. Since testing of the RBCU's can only be performed with adequate heat load in the RB, testing opportunities are limited and dependent on Unit conditions.

DESCRIPTION OF INCIDENT

An operability test was performed on the Unit 3 Reactor Building Cooling Units (RBCU's) on November 1, 1988. An analysis of the test data established that the RBCU's capacity was sufficient to declare these coolers operable up to and including January 16, 1989. On January 10, 1989, the ONS Performance Section performed a follow up operability test on the Unit 3 "A" and "C" RBCU's. The data for this test was collected at the location from which the RBCU fusible dropout plates had been removed (See LER 269/89-03). This was the first time ONS Performance had attempted to secure test data from this location. Following the test, the data was sent to the Mechanical Oconee Systems Engineering (MOSE) Group at the General

Office for analysis. The analysis of the data indicated service induced fouling of the RBCU's had reduced the performance capability of the coolers to unacceptable limits.

It was believed by ONS Performance and MOSE, the location where this data was collected could have been the cause of the unsatisfactory results. So, on January 11, the Unit 3 "A" and "C" RBCU's were retested. This time the test data was collected at the normal location (upstream of the damper). Again the test data was sent to MOSE for analysis and again unacceptable RBCU performance was indicated. Through further evaluation and discussion it was then decided that the removal of the fusible dropout plates could be causing the unsatisfactory test results.

Therefore; at 1800 hours the same day, the fusible dropout plates were reinstalled on the "C" RBCU to determine if this would improve the data. An operability test was then performed on the "C" RBCU, with the test data being collected at the normal location. The analysis of the data again indicated that the performance of the "C" RBCU had degraded to unacceptable limits. Based on this, ONS Performance and MOSE concluded the previous tests were accurate.

At 0000 hours on January 12, because of the reduced performance capabilities, the "A" and "C" RBCU's were declared inoperable. The NRC was notified at 0050 hours pursuant to 10 CFR 50.72. The "B" RBCU was tested and declared operable at 0310 hours. Operations began Reactor Power decrease at 0330 hours and at this time Maintenance Services (MS) began preparations for cleaning the "C" RBCU. The Unit was at hot shutdown at 0953 hours. Mechanical Maintenance (MM) and Construction and Maintenance Department (CMD) personnel then disassembled the "C" RBCU to allow for cleaning.

By 1830 hours, on January 12, cleaning of the "C" RBCU was completed. Assembly of the "C" RBCU was completed at 0345 hours, on January 13. An operability test of the "C" RBCU was performed at this time. Analysis of the data indicated the capacity of the cooler had increased from 31.4% (which was calculated using data from the second test) to 46.8%.

Cleaning of "A" RBCU had begun prior to the completion of testing of "C" RBCU. MM and CMD had disassembled the "A" RBCU for cleaning with the high pressure sprayer. The cleaning of "A" RBCU was completed at 1500 hours. MS visually inspected the cooler and was not satisfied with the condition of the lower coils. Therefore, MS requested recleaning of the coils. This cleaning was completed at 2145 hours. MS's visual inspection of the coolers at this time again showed cleaning was not successful. MS felt the fouling on the lower coil may be sufficient to prevent the cooler from passing the upcoming operability test. MS decided to use heated water in

conjunction with cleaning to remove the fouling from the coils. Cleaning in this manner was completed at 0600 hours and another visual inspection of the cooler was performed. This visual inspection was satisfactory and assembly of the RBCU was begun by MM and CMD. When assembly of the "A" RBCU was completed, testing of the RBCU was performed. The subsequent analysis indicated the capacity of the "A" RBCU had increased from a reading of 24.7% (which was calculated using data from the second test) to 54.8%.

Combining the final capacity of the "A" and "C" RBCU into a total capacity, resulted in a combined capacity of 101.6%. It had previously been determined by the Duke Power Nuclear Safety Analysis Group, that the combined capacity of RBCU "A" and "C" must exceed 96% of the RBCU design capacity to allow for operation of the Unit for 14 calendar days. The RBCU capacity was acceptable; therefore, the Unit 3 "A" and "C" RBCU's were declared operable at 1930 hours. Reactor power increase was begun, and by 0758 hours on January 15, the turbine/generator was on line. Reactor power reached 100% full power at 1933 hours.

CAUSE OF OCCURRENCE

It is concluded that the root cause of this incident was the impaired cooling capability of the Unit 3 Reactor Building Cooling Units (RBCU's) due to service induced fouling. Therefore, the root cause of this incident is classified as Other.

It is concluded that the fouling of the Unit 3 RBCU's occurred at a rate that was unpredictable by ONS Performance and Maintenance Oconee Support Engineering from the General Office. This conclusion is based on the fact that analysis of test data collected on the RBCU's on November 1, 1988, resulted in the approval of operation of the coolers until January 16, 1989. Testing done on the RBCU's on January 10, indicated that fouling had degraded the performance of the coolers to unacceptable levels. As a result of subsequent testing, the Unit was placed at hot shutdown conditions and the RBCU's were cleaned and retested for operability. It is also, concluded that restart of the Unit following the cleaning of the RBCU's was appropriate. This conclusion is based on facts stated in the operability evaluation of the RBCU's performed by the Duke Power Nuclear Safety Analysis Group. This evaluation declared the coolers operable up to and including the licensed power level of 2568 MW_{th} for 14 calendar days as of January 13, 1989 (i.e., through January 27, 1989).

It is concluded that the cleaning of the fouled RBCU's was sufficient. This conclusion is based on the fact that test data collected following the cleaning of the RBCU's showed an improvement in the combined capacity of

the RBCU's significant enough to allow the Unit to be restarted.

A review of incidents over the past year revealed one incident involving RBCU's. This incident occurred on August 17, 1988 (See LER 287/88-03). That incident also involved analysis of test data collected on Unit 3 RBCU's that indicated fouling had reduced the performance capabilities of the coolers. Corrective actions as a result of that incident included periodic testing of the RBCU's to verify operability and establish an appropriate fouling rate for the coolers. The ONS Performance Section was in the process of gathering data for use in evaluating operability and a fouling rate for the Unit 3 RBCU's when the degraded performance of the coolers discussed in this incident was identified. The corrective actions in LER 287/88-03 could not have prevented the fouling of the Unit 3 RBCU's but they did result in the discovery of the performance degradation of the coolers. Increased testing will be performed on the Unit 3 RBCU's as required following evaluation of data gathered using experimental instrumentation to be installed and subsequent safety analysis that will be performed.

However, because of the satisfactory results of data collected on Unit 1 January 4, (142% capacity) and on Unit 2 January 16, (143.9% capacity) these coolers will continue to be tested on a quarterly basis or as stated in future safety analyses. This incident is classified as a recurring event.

There were no radioactive material releases, radiation exposure, or personnel injuries as a result of this incident and the health and safety of the public were not compromised. This incident did not involve any component failures; therefore, it is not NPRDS reportable.

CORRECTIVE ACTIONS

The immediate corrective action was to decrease Unit 3 Reactor Power and place the unit in a hot shutdown condition.

Subsequent corrective actions were to:

Inspect and clean the Unit 3 Reactor Building Cooling Units (RBCU's) as necessary.

Establish a task force to determine the cause of fouling and recommend actions to prevent fouling of RBCU's.

Planned corrective actions are for:

ONS Performance to install experimental instrumentation to provide continuous monitoring of Unit 3 RBCU's status during Unit operation.

ONS Performance to test Unit 3 RBCU's as required based on indication of the installed experimental instrumentation and results of safety analysis performed after testing.

SAFETY ANALYSIS

Testing over the past years has indicated that the performance of certain safety-related heat exchangers, specifically the Reactor Building Cooling Units (RBCUs) and the Low Pressure Injection (LPI) coolers, may be significantly degraded from the nominal performance assumed under accident conditions. The LPI coolers and RBCUs are periodically cleaned and tested. The actual capacities of these coolers under accident conditions are determined by analysis of the test data.

Figure 6.2-3 of the Oconee FSAR gives the design heat removal capacity of the RBCUs as a function of Reactor Building temperature. This figure is based on nominal shellside flow, tubeside flow, and low pressure service water (LPSW) inlet temperature. The heat removal capacity of the RBCUs is less than the design capacity. However, the performance specifications (i.e., FSAR Figure 6.2-3) for the RBCUs are not critical in determining operability.

The Oconee Technical Specifications state that a component "shall be considered operable when it is capable of performing its intended safety functions". The intended safety function of the RBCUs is as follows:

General Design Criterion 38 states that the intended safety function for containment heat removal systems "shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident and maintain them at acceptably low levels". In addition, as is implied in 10CFR50.49, the containment heat removal system should be capable of maintaining building temperature below the Environmental Qualification (EQ) envelop following the most severe design basis accident. Therefore, the safety function of the RBCUs is to maintain containment pressure and temperature below the above described limits following an accident.

Based on the intended safety function, the following operability criterion has been established for the RBCUs:

> Equipment Qualification: The Reactor Building cooling capacity must be sufficient to prevent post-LOCA conditions from exceeding the qualifications of equipment required to mitigate a LOCA, again assuming a worst case single failure in both the LPI and RBCU systems. Compliance with this criterion also implicitly assures that the containment design pressure will not be exceeded.

Given the degraded capabilities of the RBCUs, post-LOCA Reactor Building heatup and pressurization would be mitigated by the Reactor Building Spray System, Low Pressure Injection (LPI) coolers, and the passive structural heat sinks. The Reactor Building spray system takes suction from the borated water storage tank during the injection phase, and from the sump during the recirculation phase. Reactor Building spray suction can be manually aligned to the LPI cooler discharge in order to obtain cooler spray at the discretion of station management. The potential exists that the long term Reactor Building response may exceed the Environmental Qualification (EQ) envelope with a complete failure of the RBCUs. The probability of actually exceeding the EQ envelope is considered to be low considering the substantial period of time that exists for damage control measures and for optimizing the mitigation capability of the above mentioned systems.

In conclusion, the degraded RBCU heat transfer capability resulted in the violation of the existing analysis for environmental qualification and post-LOCA cooling at some point in the 11th fuel cycle. Since these conclusions are based upon the conservative analyses documented in the FSAR, acceptable results could be expected had an accident occurred under the actual conditions present (e.g., without the most limiting single failure). During the period of degraded capacity, no event occurred which required the accident mitigation functions of RBCUs and there have been no radiological releases; therefore, the health and safety of the public was not effected by this event.

Duke Power Company
P.O. Box 33198
Charlotte, N.C. 28242

Hal B. Tucker
Vice President
Nuclear Production
(704)373-4531

DUKE POWER

February 22, 1989

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

Subject: **Oconee Nuclear Station**
Docket Nos. 50-269, -270, -287
LER 287/89-01

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report (LER) 287/89-01 concerning a Unit 3 shutdown due to fouled reactor building cooling units.

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(v)(D). This event is considered to be of no significance with respect to the health and safety of the public. My letter of February 10, 1989 informed the NRC of the delay in submitting this report.

Very truly yours,

Hal B. Tucker

PJN/ler9

Attachment

xc: Mr. M.L. Ernst
Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
101 Marietta St., NW, Suite 2900
Atlanta, Georgia 30323

Ms. Helen Pastis
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. P.H. Skinner
NRC Resident Inspector
Oconee Nuclear Station

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

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

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

IE22
1/1