



**Duke Energy**

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W. R. McCollum, Jr.  
Vice President

January 18, 2001

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

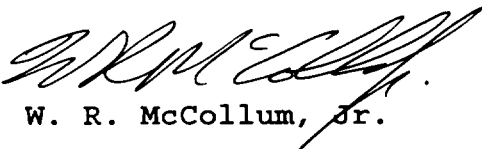
Subject: Oconee Nuclear Station  
Docket Nos. 50-269,-270, -287  
Licensee Event Report 50-270/2000-02, Revision 00  
Problem Investigation Process No.: O-00-4643

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 270/2000-02, concerning operation with two trains of the Chilled Water System out of service. In this condition, the plant's Technical Specifications require entry into Technical Specification 3.0.3. During this event, Units 2 and 3 initiated shutdown in accordance with Technical Specification 3.0.3.

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

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Document Control Desk  
Date: January 18, 2001  
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cc: Mr. Luis A. Reyes  
Administrator, Region II  
U.S. Nuclear Regulatory Commission  
61 Forsyth Street, S. W., Suite 23T85  
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Mr. M. C. Shannon  
NRC Senior Resident Inspector  
Oconee Nuclear Station

**LICENSEE EVENT REPORT (LER)**

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

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), 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. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

<b>FACILITY NAME (1)</b> Oconee Nuclear Station, Unit 2	<b>DOCKET NUMBER (2)</b> 05000 - 270	<b>PAGE (3)</b> 1 OF 7
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**TITLE (4)**  
TS 3.0.3 Shutdown Initiated due to Control Room Cooling Chillers

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
12	19	00	2000	- 02	- 00	01	18	01	Unit 3	05000 - 287
									FACILITY NAME	DOCKET NUMBER
										05000 -

<b>OPERATING MODE (9)</b> 1	<b>POWER LEVEL (10)</b> 100%	<b>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)</b>								
		20.2201(b)	20.2203(a)(2)(v)	<input checked="" type="checkbox"/>	50.73(a)(2)(i)(B)	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)	Specify in Abstract below or in NRC Form 366A				
		20.2203(a)(2)(iv)	50.36(c)(2)		50.73(a)(2)(vii)					

**LICENSEE CONTACT FOR THIS LER (12)**

<b>NAME</b> L.E. Nicholson, Regulatory Compliance Manager	<b>TELEPHONE NUMBER (Include Area Code)</b> (864) 885-3292
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**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

<b>SUPPLEMENTAL REPORT EXPECTED (14)</b>				<b>EXPECTED SUBMISSION DATE (15)</b>		
<input checked="" type="checkbox"/>	YES (If yes, complete EXPECTED SUBMISSION DATE).	<input type="checkbox"/>	NO	MONTH	DAY	YEAR
				07	16	01

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

On December 19, 2000, Oconee Units 2, and 3 were operating in Mode 1 at 100% power, and Unit 1 was in Mode 6. During a Low Pressure Service Water System Flow Test, Control Room Zone (CRZ) HVAC Chiller "A" tripped at 1305 hours. Chiller "B" subsequently tripped at 1352 hours. Units 2 and 3 entered Technical Specification (TS) 3.0.3 due to a loss of two Chilled Water trains per TS 3.7.16. The flow test was aborted and air was vented from chiller service water (CSW) piping. Chiller "B" was started at 1426 but was not immediately declared operable. Units 2 and 3 initiated power reduction at 1452. At 1521, Chiller "B" was declared operable and both Units 2 and 3 exited TS 3.0.3 at 99.5% power.

A root cause investigation found that the flow test conditions allowed air at the CSW discharge piping to go through a recirculation valve to the idle "B" CSW recirculation loop and then into the "A" CSW suction. Air binding of the CSW pumps caused the Chillers to trip. The investigation is continuing to determine the air source in the discharge piping. Corrective actions include procedural guidance for venting and evaluation of more permanent solutions to the problem. During the event, CRZ temperatures remained well within TS 3.7.16 limits. This event is considered of no significance with respect 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)

EVALUATION:

BACKGROUND

This event is reportable per 10CFR 50.73(a)(2)(i)(B), "Any operation or condition prohibited by the plant's Technical Specifications." This event placed Units 2 and 3 in Improved Technical Specification (ITS) 3.7.16, Condition E, which requires entry into LCO 3.0.3.

Oconee Units 1 and 2 share a common Control Room, while Unit 3 has a separate Control Room.

The Oconee Control Room Area Cooling System (CRACS) [EIIS:VI] maintains the Control Room Zone temperatures within the limits assumed as initial conditions within the post-accident analyses. Two associated chillers [EIIS:CHU] provide both control room zones with Chilled Water [EIIS:KM] and are cooled by Chiller Service Water (CSW) that is drawn from the Condenser Circulating Water (CCW) [EIIS:BS] system.

There is no automatic start feature for the CRACS since the cooling function is not required during the first 18 hours of an event. The design basis for operation of this system after an accident assumes an initial loss of power and subsequent manual operator action to realign power and manually restart system components.

ITS 3.7.16 contains the requirement for CRACS. If one Chilled Water train is inoperable, ITS 3.7.16, Condition B, allows thirty days to restore the inoperable chiller. If both Chilled Water trains are inoperable, ITS 3.7.16, Condition E, invokes ITS 3.0.3 for any unit in Modes 1, 2, 3, or 4. ITS 3.7.16 also includes a surveillance requirement to verify the Control Room Zone temperatures to be within specified limits. If these limits are exceeded, a 7-day action statement applies.

Prior to this event, Units 2 and 3 were operating in Mode 1 at 100% power. Unit 1 was in Mode 6. The "A" Chiller was in service but considered inoperable while undergoing a 24-hour post maintenance test, therefore Units 2 and 3 were in ITS 3.7.16, Condition B. The "B" Chiller was operable in stand-by. No other safety systems or components were out of service that would have contributed to this event.

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Also prior to this event, the Unit 1 CCW System was in a siphon flow mode (i.e. with no pumped flow) for performance of PT/1/A/0251/023 "LPSW System Flow Test." In this test alignment, the Unit 1 CCW piping supplies water from Lake Keowee to the CSW pumps, which is then pumped through the chiller heat exchanger (condenser). Depending on chiller heat load, a portion of the heat exchanger discharge is recirculated to control the chiller inlet temperature. The remaining discharge flow is routed to a discharge header, which discharges into the Unit 2 CCW discharge piping. In siphon flow mode, water pressure in the CSW piping is lower than during forced flow and is affected by the lake level. At the lake level observed during the LPSW System Flow test, portions of the CSW piping were below atmospheric pressure.

**EVENT DESCRIPTION**

At approximately 1305 hours on December 19, 2000, "A" Chiller tripped and could not be successfully restarted.

At 1335 hours, PT/1/A/0251/023 "LPSW System Flow Test" was aborted and a CCW pump was started to return the system to normal configuration with forced flow. At 1344, Operations attempted another unsuccessful restart of "A" Chiller.

At 1350 hours, "B" Chiller was started but it subsequently tripped at 1352 hours. Operations declared entry into ITS 3.7.16, Condition "E" (both chillers inoperable), which invoked ITS 3.0.3, as of 1352 hours.

In all cases, the trip signals and operating parameters recorded by the chiller control system indicated that the chiller condensers were not receiving proper flow. Air binding was suspected as the cause.

The service water piping in recirculation loops at the chillers was vented and air was found in the high points of the piping. At 1426 hours, the "B" Chiller was successfully restarted. Operations did not immediately declare "B" Chiller operable, but conservatively waited for the "B" Chiller to demonstrate that it would successfully operate for an extended period with no additional indications of air in the piping.

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At 1452 hours, Operations commenced a power reduction on Units 2 and 3 at 1%/hr in accordance with ITS 3.0.3.

At 1455 hours, Oconee notified the NRC per 10CFR50.72(b)(1)(i)(A) (NRC Event Number 37619).

At 1521 hours, the 'B' Chiller was declared operable. Units 2 and 3 exited ITS 3.0.3 but remained in Condition "B" of ITS 3.7.16. At 1609 hours Oconee made a follow-up NRC notification that the 'B' Chiller was restored to operable, that ITS 3.0.3 was exited, and the power reduction was halted on Units 2 and 3 at approximately 99.5%.

After the initial chiller trip, Operations initiated more frequent monitoring of temperatures in the Control, Cable, and Electrical Equipment rooms. The ITS temperature limits were not challenged in any of these rooms during this event.

**CAUSAL FACTORS**

A Failure Investigation Process (FIP) Team was formed to investigate the cause of this event. A special radiography test confirmed that an air bubble was present at the common discharge line of the CSW downstream of the valves that control the recirculation/discharge split for both Chillers. This portion of pipe does not have a local high point vent. The FIP Team concluded that, during the siphon flow tests, some of that air was drawn into the recirculation piping of the idle chiller due to system pressure differences. During normal forced flow, Operations performed periodic venting of the recirculation lines but found no air accumulation even though an air bubble was still present in the common piping downstream of the control valves. Therefore, it appears that air movement leading to air binding only occurs during siphon flow mode. Investigation is continuing to determine the source of the air at the common discharge line. Therefore, the root cause is unknown at this time. Additional corrective actions will be dependent on determining the source of the air. This LER will be revised as appropriate when the investigation is complete.

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CORRECTIVE ACTIONS

Immediate:

1. The LPSW System Flow Test was aborted and the system alignment returned to pumped flow rather than siphon flow.
2. Chiller Service Water piping was vented. "B" Chiller was restored to service within 34 minutes. After demonstrating acceptable operation, "B" Chiller was declared operable.
3. Units 2 and 3 initiated Unit Shutdown as required by ITS 3.0.3.

Subsequent

1. Operations revised appropriate procedures to add guidance for immediate compensatory actions to vent the CSW piping if CSW flow is lost during siphon flow mode.
2. A special test was conducted to simulate the conditions experienced in this event. It confirmed that air was present at the service water discharge for the chillers and was transported to the idle chiller loop and, eventually, to the in-service chiller.

Planned

1. Oconee will continue to pursue resolution to the issue of air accumulation in the chiller service water piping. Future actions could include further procedural enhancements, plant modifications, or a combination thereof.

There are no NRC Commitment items contained in this LER.

SAFETY ANALYSIS

The Control Room Zone temperatures did not challenge ITS limits or assumed limits on initial conditions during this event. The temperature at which limiting components are assumed to become inoperable is 120F in the cable and equipment rooms and 100F in the control room. The calculated time to reach these limits following

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a Loss Of Coolant Accident (LOCA) with Loss Of Offsite Power (LOOP), assuming no cooling, is greater than 18 hours.

The Loss of Power Abnormal Procedure is referenced by the Emergency Operating Procedure and contains steps to restore power and restart the CRACS system within 18 hours after the initial event. Actual restart would be expected to occur much sooner. During this event, the actual time from the initial chiller trip until Chiller "B" was successfully restarted was less than 90 minutes. Chiller "B" was declared operable within approximately 2 hours and thirty minutes of the initial chiller trip. Therefore, given the staffing available in an accident scenario, the diagnosis and correction of this type of problem can reasonably be expected to occur within the 18 hours supported by heat up calculations. System restoration within that time would prevent the operating limits of any components from being exceeded.

An additional function related to CRACS is the function of the Control Room Ventilation System Booster Fans to provide filtered air to pressurize the control room for control of radioactive and chemical contaminants. This event had no impact on the booster fans, Control Room pressurization, or post-accident Control Room doses.

Therefore, engineering judgement indicates that this event did not prevent the fulfillment of any safety function and did not result in a Safety System Functional Failure. The health and safety of the public was not affected by this event.

**ADDITIONAL INFORMATION**

Licensee Event Reports 50-269/2000-02, dated April 6, 2000, and 50-269/2000-03, dated July 6, 2000, also addressed entry into ITS 3.0.3 due to inoperable chillers. However, these events did not involve initiation of unit shutdown. The causes of these events are different from the current event and they are not considered recurring.

There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.

Oconee anticipates that this event may be determined to be reportable under the Equipment Performance and Information Exchange



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(EPIX) program. However, a final root cause determination has not been reached. Therefore the appropriate system, component, and cause are not known at this time.