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DOCKET #  
05000269

SUBJECT: LER 89-016-00: on 800215, design oversight results in  
 potential for unanalyzed breach of containment isolation.  
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**DUKE POWER**

November 16, 1989

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

Subject: Oconee Nuclear Station  
Docket Nos. 50-269, -270, -287  
LER 269/89-16

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/89-16 concerning design oversight results in potential for unanalyzed breach of containment isolation during a simultaneous LOCA/seismic event.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(vii)(c). This event is considered to be of no significance with respect to the health and safety of the public.

A supplement to this report will be submitted by December 16, 1989. The supplement will provide the safety analysis, and will further address corrective actions.

Very truly yours,

*M. S. Tuckman/RCS*

M. S. Tuckman  
Station Manager

TDC/ftt

Attachment

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## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Oconee Nuclear Station, Unit 1										DOCKET NUMBER (2) 0 5 0 0 0 2 6 9					PAGE (3) 1 OF 0 6	
TITLE (4) Design Oversight Results in Potential for Unanalyzed Breach of Containment Isolation During A Simultaneous LOCA/Seismic Event																
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 2	1 5	8 0	8 0	0 1 6	0 0	1 1	1 6	8 9	Oconee Unit 2				0 5 0 0 0 2 7 0			
									Oconee Unit 3				0 5 0 0 0 2 8 7			
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)				20.406(a)				80.73(a)(2)(iv)				73.71(b)		
POWER LEVEL (10)		0 0 0				20.406(a)(1)(i)				80.73(a)(2)(iv)				73.71(a)		
		20.406(a)(1)(ii)				80.73(a)(2)(i)				X 80.73(a)(2)(vi)				OTHER (Specify in Abstract below and in Test, NRC Form 305A)		
		20.406(a)(1)(iii)				80.73(a)(2)(ii)				80.73(a)(2)(vii)(A)						
		20.406(a)(1)(iv)				80.73(a)(2)(iii)				80.73(a)(2)(viii)(B)						
		20.406(a)(1)(v)				80.73(a)(2)(iv)				80.73(a)(2)(ix)						
LICENSEE CONTACT FOR THIS LER (12)																
NAME Henry R. Lowery, Chairman Oconee Safety Review Group										TELEPHONE NUMBER AREA CODE 8 0 3 8 1 8 5 1 - 3 0 3 4						
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																
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X YES (If yes, complete EXPECTED SUBMISSION DATE)												NO		1 2	1 6	8 9

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

## ABSTRACT

On October 17, 1989 Design Engineering (DE) notified the station that during a simultaneous LOCA/seismic event an unanalyzed breach of containment could result in the discharge of containment atmosphere to the environment. The problem was identified as a result of discussions between station and DE personnel. The problem has existed since Nuclear Station Modification (NSM) 1261 installed non-seismic Reactor Building Auxiliary Coolers (RBACs) in all three containment buildings, between 1980 and 1982. The design of NSM 1261 was based on LPSW design pressure versus actual system operating pressure. Portions of the NSM were consequently not designed to seismic requirements. These portions are located inside containment and if they were to fail while Reactor Building (RB) pressure was at the maximum design pressure (59.0 psig) during an accident, RB pressure could force containment atmosphere into the ruptured LPSW piping, out to the environment. Immediate corrective action was to isolate the "B" Reactor Building Cooling Unit (RBCU) which placed each unit in a 7 day Limiting Condition of Operation (LCO). Subsequent corrective action was to install flat plates in flanged connections in the LPSW piping to isolate the non-seismic piping from the seismic portions of the system and all units exited the LCO on October 19, 1989. Root cause is Design Deficiency, Design oversight due to failure to recognize the potential interaction between high RB pressure during a LOCA/seismic event and the relatively lower LPSW pressure. Planned corrective action is to seismically qualify the RBACs and associated piping. The units have operated in all modes while this condition existed.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104

EXPIRES 8/31/85

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		08	9016	00	02	OF	06
Oconee Nuclear Station, Unit 1	05000269	89	016	00	02	OF	06

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

BACKGROUND

The Low Pressure Service Water (LPSW) system [EIIS:BI] provides cooling water to various safety and non-safety related systems and components. LPSW is supplied from and discharges to the Circulating Cooling Water (CCW) system [EIIS:BS] which takes a suction from and returns to Lake Keowee. There are three Reactor Building Cooling Units (RBCUs) [EIIS:BK] and four Reactor Building Auxiliary Coolers (RBACs) [EIIS:BK] per unit. LPSW supply and return headers for the RBCUs are located outside of containment. Each RBCU has its own branch supply and return LPSW lines which penetrate containment [EIIS:NA] and can be isolated from the RBCU by Engineered Safeguards (ES) [EIIS:JE] motor operated valves, however the normal and ES positions for these valves is OPEN. Radiation monitor (RIA) [EIIS:IL] 31 monitors effluent from each RBCU train. A diagram of a typical 'B' RBCU train and LPSW piping is provided as Attachment 1.

The RBCUs provide containment cooling during normal and accident conditions. During an accident the RBCUs, in conjunction with the Building Spray system [EIIS:BE], work to maintain Reactor Building pressure less than the maximum design pressure of 59.0 psig.

The branch supply line to the 'B' train RBCU has a tap-off line which supplies LPSW through ES valve LPSW-565 to the RBACs. Each RBAC has separate supply and return lines. LPSW from the RBACs enters a combined return and then passes through LPSW-567, the discharge isolation check valve, before tying into the 'B' RBCU return line.

Nuclear Station Modification (NSM) 1261, which installed the RBACs and associated piping, was implemented due to problems with high Reactor Building (RB) temperatures which limited personnel stay times during outages. The design of NSM 1261 called for the addition of four separate RBACs per unit. The RBACs were not intended to fulfil any safety-related function, therefore only portions of the LPSW containment piping were designed to meet seismic qualifications. The remainder of the piping as well as the RBACs themselves were designed and constructed to non-QA, class G requirements.

EVENTS DESCRIPTION

Prior to 1980, Oconee Nuclear Station was experiencing problems with excessively high Reactor Building (RB) temperatures. The decision was made to add four Reactor Building Auxiliary Coolers (RBACs) to each unit. These coolers were to be for habitability improvement and had no safety-related function. As a result the design called for the RBACs and portions of the piping to be non-seismically qualified.

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Oconee Nuclear Station, Unit 1	0500026989	—	016	—00	03	OF	06

TEXT: If more space is required, use additional NRC Form 368A (1/17)

During the design of the Nuclear Station Modification (NSM) 1261, Design Engineering (DE) personnel failed to consider actual Low Pressure Service Water (LPSW) pressure and based the piping design on the system design pressure. Actual operating pressure was significantly lower than design pressure therefore assumptions made during the design that LPSW pressure would exceed postulated Reactor Building pressures during a simultaneous LOCA/seismic event were in error.

NSM 1261 design packages were prepared and reviewed by three separate individuals in DE. The 10CFR50.59 safety evaluations were also performed by the same individuals. Subsequent revisions to the NSM design and safety analyses did not reveal the errors in the assumptions. After preparation, the design package was transmitted to the station for review and implementation.

Implementation of NSM 1261 was completed on; (Unit 1) February 15, 1980; (Unit 2) March 13, 1982; (Unit 3) August 9, 1982. The problem of the potential for an unanalyzed flowpath through containment has existed since installation of NSM 1261, for each unit.

On October 17, 1989, station Performance and DE personnel were discussing testing requirements for LPSW-567, a check valve in the LPSW return line from the RBACs. At the time of the discussions, LPSW-567 was not included in a containment leak rate testing program nor was it required to be periodically stroke tested. An active valve list which DE had transmitted to the station, and which included LPSW-567, had prompted the discussions. During the course of the discussions, DE personnel recognized the potential for an unanalyzed breach of containment which had resulted from installation of non-seismic piping in the RB and notified station management.

Immediate corrective action was to isolate LPSW from the RBACs. This was accomplished by closing LPSW-19 and 21, 'B' train RBCU supply and return isolation valves. Taking a train of the RBCUs out of service placed the units in a seven day Limiting Condition of Operation (LCO).

Removing the RBACs from service caused RB temperatures to increase. Temperatures exceeded the Final Safety Analysis Report assumptions of initial RB temperatures for containment analysis. DE provided operability evaluations which increased both the steady state and short duration RB temperature limits on all three units.

To allow the station to place the 'B' train RBCUs back in service and exit the LCO, a temporary modification (TM) was planned. The TMs, 660, 661, and 662, for units 1, 2, and 3, respectively, were to install flat plates (pancakes) in the pipe to expansion joint flanged connections in the RBAC

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104

EXPIRES 8/31/85

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Oconee Nuclear Station, Unit 1	0 5 0 0 0 2 6 9 8 9	—	0 1 6	—	0 0	0 4	OF 0 6

TEXT (If more space is required, use additional NRC Form 306A's) (17)

return lines. The installation of the plates was to isolate the seismic QA condition 4 (QA-4), Duke class D piping from the non-seismic piping. In order to qualify the plate installation as QA-4, DE upgraded the existing pipe flanges, which mated to the expansion joint flanges in the RBAC return lines, to class D, seismic requirements. These pipe flanges had been installed during the implementation of NSM 1261 and were procured as class G, non-QA condition.

The installation of the temporary modifications was completed and the 'B' train RBCUs placed back in service on October 19, 1989. Placing the RBCUs in service allowed the units to exit their LCOs. Planned corrective action is to seismically qualify the RBACs and associated piping.

#### CONCLUSIONS

During the design of NSM 1261, assumptions made, with regard to relative Reactor Building (RB) and Low Pressure Service Water (LPSW) system pressures were in error. The root cause is Design Deficiency, Design oversight due to the failure to recognize the potential interaction between RB atmosphere and the LPSW system during a simultaneous LOCA/seismic event.

Oconee Nuclear units were constructed prior to the origination of Appendix J, containment leak rate testing program requirements. In order to comply with the intent of Appendix J requirements, Oconee Nuclear Station's safety analyses assume that seismically designed containment piping will not fail as a result of the effects (eg., missile damage and pipe 'whip') of a LOCA. The persons in Design Engineering (DE) who were responsible for the design and 10CFR50.59 safety analyses for NSM 1261 were not adequately knowledgeable of the containment requirements applicable to the NSM. The RBACs and associated new LPSW piping were additions to the existing LPSW containment piping and, as such, should have been designed to the same seismic requirements, or remote operated isolation valves should have been installed to allow isolation of the seismic and non-seismic portions of LPSW.

Two distinct Design Engineering groups now perform the design and safety evaluation functions previously performed by one group. As a result, incorrect assumptions made during the design process have an increased likelihood of being detected during the safety analysis process. In addition, planned corrective action, to help prevent similar errors, is to provide additional training in containment piping design requirements to responsible DE personnel.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES 8/31/95

FACILITY NAME (1)  Oconee Nuclear Station, Unit 1	DOCKET NUMBER (2)  0500026989	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		89	016	00	5	OF	6

TEXT (If more space is required, use additional NRC Form 306A's) (17)

This report involves no component failures and therefore is not NPRDS reportable. There were no radiation exposures, radioactive releases, or injuries associated with this event and the health and safety of the public was not affected. A review of previous incidents indicates this is not a recurring event.

CORRECTIVE ACTIONSImmediate

1. Closed LPSW-19 and LPSW-21, Reactor Building Cooling Unit 'B', Low Pressure Service Water (LPSW) supply and return isolation valves.

Subsequent

1. Installed pancakes between the flanges at the outlet side of expansion joints in LPSW return lines from the Reactor Building Auxiliary Coolers (RBACs). This isolated the non-seismic LPSW piping.

Planned

1. Provide training to appropriate Design Engineering personnel in containment integrity considerations.
2. The RBACs and associated LPSW piping will be seismically qualified through a combination of station modifications and DE calculations to qualify existing welds, components, and support restraints.

SAFETY ANALYSIS

The Safety Analysis will be provided in a supplemental report.

