Duke Power
A Duke Energy Company

W. R. McCollum, Jr.
Vice President

Duke Power
Oconee Nuclear Site
7800 Rochester Highway
Seneca, SC 29672
(864) 885-3107 OFFICE
(864) 885-3564 FAX

March 17, 2000

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269
Licensee Event Report 269/2000-01, Revision 0
Problem Investigation Process No.: O-00-0611

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 269/2000-01, Revision 0, concerning completion of a unit shutdown required by Technical Specifications. The shutdown was due to an unisolable Reactor Coolant Leak of approximately 0.04 gpm.

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

Very truly yours,

Bentley K Jones for WRMcCollum Jr.

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 Senior Resident Inspector
Oconee Nuclear Station

bxc: ONS Site:

Document Control (Master File)*	PIP FILE*
SA MGR/W.W. Foster	RGC MGR/L.E. Nicholson
EPIX Cord/J.C. Mumford	Vis Cntr Mgr/T.J. Pettit
Training Mgr/B.K. Jones	
OPS-Procedures/D.B. Coyle#	HR: T.L. Williams#
RGC: Commitment Index/J.E. Smith#	LER Book*#
Work Control: D.V. Deatherage#	
Site Engineering:	ENG Mgr/M.K. Nazar#
W.B. Edge#	R.L. Barnes#
C.A. Little#	T.A. Ledford#
L.J. Azzarello#	

GO:

NAIA/C.J. Thomas*	Reg Audits/L.A. Keller
ELL/EC050*	NSRB/T.M. Neel/EC05P*
NGO/SAA: H.D. Brewer	C.M. Misenheimer#
NGO/SA/G.B. Swindlehurst	
NGO Serv: J.M. Davis#	R.G. Hull#
LEGAL/L.F. Vaughn*	
RATES: M.J. Brown/EC11C*	

CNS:

SA MGR/R.L. Sweigart	RGC MGR/G.D. Gilbert

MNS:

SA MGR/B.J. Dolan	RGC MGR/M.T. Cash
OPS Mgr/S.L. Bradshaw#	

Non-routine Recipients:
None

* - Hardcopy - All others by LOTUS NOTES Distribution
# - Copied By Request: - All others by Directive

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)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit 1	05000 - 269	1 OF 7

TITLE (4)

Shutdown for Unisolable RCS Leak due to Thermal Cycling In Drain Line

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 05000
2	16	00	2000	- 01 -	00	3	17	00	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1	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)(A)	50.73(a)(2)(viii)
POWER LEVEL (10)	100%	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)

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

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 SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

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

On 2/16/2000, during a Reactor Building entry with Unit 1 at 100% in Mode 1, a System Engineer observed an unisolable vapor leak at the 1B2 cold leg loop drain line on a low point of the Reactor Coolant System (RCS). The leak rate was determined to be approximately 0.04 gpm.

In response, Operations shutdown the unit in accordance with Technical Specification 3.4.13, Condition B.

The leak was in the base metal of the outer radius of a 1-1/2 inch 90 degree piping elbow. The root cause of this event is thermal fatigue in the drain pipe. Completed actions included replacement of the elbow and inspection of equivalent drains on the three other RCS loops. No other indications were identified. Planned actions during the next appropriate outages are to inspect equivalent drains on Units 2 and 3, and to insulate portions of these lines on all units to limit future thermal cycling.

This event is considered to have no significance with respect to the health and safety of the public.

EVALUATION:

BACKGROUND

This report addresses completion of a unit shutdown required by Technical Specifications. The shutdown was due to an unisolable Reactor Coolant Leak of approximately 0.04 gpm. This event is reportable per 10CFR 50.73(a)(2)(i)(A).

Technical Specification (TS) 3.4.13 allows no pressure boundary leakage from the Reactor Coolant System (RCS) [EIIS:AB]. If RCS pressure boundary leakage is determined to exist, TS 3.4.13, Condition B requires the affected unit to be in Mode 3 within 12 hours and to be in Mode 5 within 36 hours.

Prior to this event, Unit 1 was operating at 100% power with no safety systems or components out of service that would have contributed to this event.

EVENT DESCRIPTION

On 2/8/2000, a Systems Engineer noted that computer trending indicated an increase in the Unit 1 Reactor Building (RB) Normal Sump rate of approximately 0.04 gpm. This indicated leak rate was too low to be distinguished from random variations in the RCS leakage surveillances performed by Operations.

Plans were made to conduct a reactor building entry for several unrelated issues on 2/16/2000, with Unit 1 at 100% in Mode 1. The System Engineer participated with the intent to inspect for the suspected leak. He observed a vapor leak on a 1-1/2 inch RCS drain line at the outer radius of a 90 degree piping elbow. This portion of the RCS pressure boundary was NOT capable of being isolated.

At 1305, 2/6/2000, the Operations Shift Manager was notified.

At 1352, Operations initiated Reactor shutdown per TS 3.4.13, Condition B.

At 1441, Operations made a one hour non-emergency notification to the NRC.

At 2043, Mode 3 was entered.

On 2/17/00 at 2325, Mode 5 was entered, completing the required action statement.

A Failure Investigation Process (FIP) Team was assembled to determine the root cause of the leak and to specify appropriate corrective actions.

The affected line is a RCS drain line connected to the low point of cold leg pipe connecting the 1B Steam Generator to the suction of the 1B2 Reactor Coolant Pump. A similar drain line exists on RCS piping to each of the four reactor coolant pumps, except that one of the other lines is larger and also provides a flow path for normal Reactor Coolant Letdown.

All four drain lines were inspected using an approved Ultrasonic Test (UT) procedure. This procedure was written to identify small, tight indications typical of thermal fatigue. This procedure identified indications at the point of the leak. Dye Penetrant tests (PT) from the outer surface also showed indications at the leak point. No other indications were found on any of the tested drain lines.

The leaking elbow in the drain piping was removed and a new elbow was installed. The removed elbow was sent to the Duke Power Metallurgical Laboratory for destructive examination.

The affected portion of the drain line is 1-1/2 inch schedule 160 piping, which has an outer diameter of 1.900 inches and a thickness of 0.281 inch. See Attachment A. The leaking elbow was found to have two principle flaws in the base metal, approximately 1 inch from the center of the outside radius, and approximately 1.9 inches from the elbow-to-system weld. One of these flaws was a through-wall crack and was the source of the leak. The other flaw was approximately 50% thru wall. Other minor indications existed on the inner surface in the same area.

The Metallurgical Laboratory personnel attributed the flaws to thermal fatigue. The leak was considered to have developed over an extended period of time (i.e. years).

CAUSAL FACTORS

The root cause of this event was thermal fatigue due to cyclical turbulent penetration of hot RCS water into the stagnant drain pipe. This is considered an unanticipated system interaction. These drain lines are currently uninsulated, which may have contributed to the frequency of the thermal cycles and/or the magnitude of the resulting stresses.

These drain lines are subject to Inservice Inspection (ISI). The required examinations are a periodic Dye Penetrant surface examination of the welds and 1/2 inch of base metal to either side of the welds, and a Class A pressure test with visual inspection (VT-2) following each refueling outage. The affected area, i.e. base metal of the elbow some distance from welds, was not subject to ISI such as UT, PT, or Radiograph. The most recent PT on the elbow was on the system to elbow (i.e. upstream) weld during 1EOC16 in November/December 1995. This PT examination would not have detected an internal flaw, and would not have covered the portion of the elbow where the leak actually occurred. The last pressure test with VT-2 was performed during startup from the 1EOC18 refueling outage in July 1999 and would not have detected this flaw unless it was already through-wall at the time. Therefore, routine ISI examinations would not have been expected to reveal these flaws.

A search was conducted for similar events at Oconee. No similar events with the same root cause have occurred at Oconee within the prior two years.

CORRECTIVE ACTIONS

Immediate:

1. Unit 1 was brought to Mode 5, as required by TS.

Subsequent:

1. The leaking elbow was removed for laboratory examination and was replaced.

2. The other three similar drain elbows on RCP suction piping were inspected by UT with no indications.

3. The FIP team screened all other piping attached to the RCS and determined that no other locations were susceptible to this failure mode.

4. The FIP Team evaluated the potential for similar flaws or leaks on the equivalent piping on the other two Oconee Units. The evaluation concluded that the probability of a leak on another Oconee Unit prior to inspection during planned refueling outages is small, that any similar leak would initially be small, and that it would be detected promptly. Therefore, continued operation of Units 2 and 3 is not a safety concern.

Planned:

1. The equivalent piping on Oconee Units 2 and 3 will be inspected using UT during the next refueling outages on those units (scheduled to begin April, 2000 for Unit 3, and May, 2001 for Unit 2).

2. An appropriate length of the drain lines will be insulated during the next scheduled refueling outage on each of the three units. This is expected to limit the potential for thermal cycling in the future.

There are no NRC Commitment items contained in this LER.

SAFETY ANALYSIS

The leak in this event was in an unisolable portion of the Reactor Coolant System. The leak rate observed in this event was approximately 0.04 gpm, as indicated by the change in RB sump rate. This leak rate is well within the capacity of the normal make-up system. By definition, a leak is classified as a Loss of Coolant Accident (LOCA) only if it exceeds the capacity of the normal make-up system.

The principle significance of a leak such as that described in this event depends on its potential to develop into a more significant leak. An analysis concluded that the margin to failure and the factor of safety for the observed flaw on the drain line was adequate such that the pipe itself would not have failed under design loading conditions.

Furthermore, the mechanism causing the leak to develop (i.e. thermal cycling) resulted in slow growth of the flaw over a period of years. There was no measurable increase in the leak rate from 2/8/2000, when a slight increase in leakage inside containment was first indicated, through 2325 on 2/17/2000 when Mode 5 was entered after the RCS was depressurized.

In the absolute worst case, if the 1.5 inch diameter drain line had failed in a full break, the break size would have been limited to 0.00976 square feet, with a calculated flow rate of approximately 1250 gpm. For comparison, the smallest LOCA analyzed in the Oconee UFSAR is 0.04 square feet. Therefore this event is bounded by existing small break LOCA analyses. The Oconee PRA analysis does not calculate a frequency for leaks of the size actually observed.

In conclusion, the leak rate observed in this event was approximately 0.04 gpm. This rate is well within the capacity of the normal make-up system. The leak was slow growing and, therefore, had little chance of exceeding the capacity of the make up system prior to discovery. The leak was within containment and did not result in any release of radioactive materials. Therefore the actual event was not significant with respect to the health and safety of the public.

ADDITIONAL INFORMATION

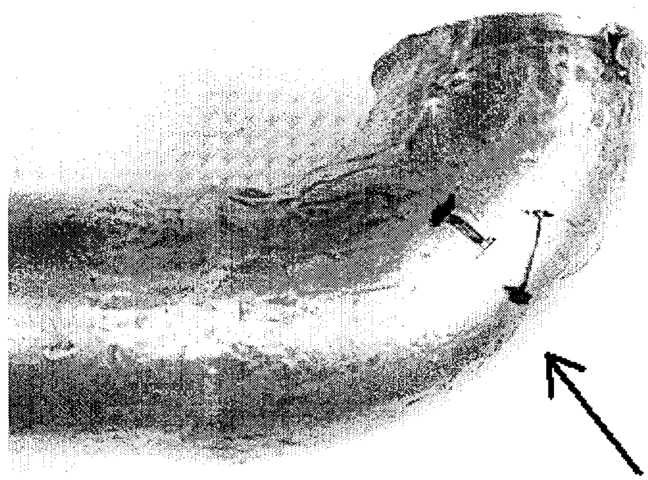
There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.

This event is not considered reportable under the Equipment Performance and Information Exchange (EPIX) program.

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

Attachment A
Reactor Coolant System
1B2 Drain Line Leak
90 Degree Elbow 1 1/2 inch Schedule 160

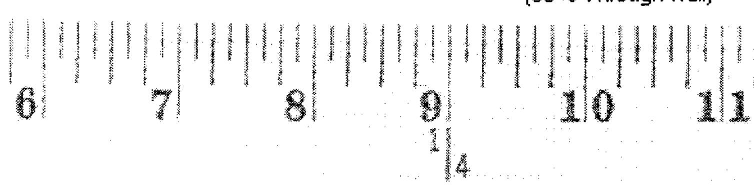
To Safe End: From Drain on Steam Generator outlet pipe to 1B2 Reactor Coolant Pump Suction



To Component Drain Header

Flaw Locations:
Shorter Line is Leak (100 % Through-wall)

Longer Line is Internal (50 % Through-wall)



Scale in Inches