AEC DISTRIBUTION FOR PART 50 DOCKET MATERIAL
(TEMPORARY FORM)

CONTROL NO: 4036

FILE: A/0

FROM:	DATE OF DOC	DATE REC'D	LTR	MEMO	RPT	OTHER
Duke Power Company Charlotte, North Carolina A. C. Thies	4-30-74	5-6-74	X			

TO:	ORIG	CC	OTHER	SENT AEC PDR XXX SENT LOCAL PDR XXX
Angelo Giambusso	1 signed			

CLASS	UNCLASS	PROP INFO	INPUT	NO CYS REC'D	DOCKET NO:
	XXX			1	50-270

DESCRIPTION:

Ltr trans the following......

PLANT NAME: OCONEE UNIT #2

ENCLOSURES:

Supplemental Rpt to Abnormal Occurrence Rpt #AO-207/74-2 (AO-270/74-2A)

ACKNOWLEDGED
DO NOT REMOVE

(1 cy encl rec'd)

FOR ACTION/INFORMATION 5-7-74 GMC

BUTLER(L)	✓SCHWENCER(L)	ZIEMANN(L)	REGAN(E)
W/ Copies	W/ 2 Copies	W/ Copies	W/ Copies
CLARK(L)	STOLZ(L)	DICKER(E)	
W/ Copies	W/ Copies	W/ Copies	W/ Copies
PARR(L)	VASSALLO(L)	KNIGHTON(E)	
W/ Copies	W/ Copies	W/ Copies	W/ Copies
KNIEL(L)	PURPLE (L)	YOUNGBLOOD(E)	
W/ Copies	W/ Copies	W/ Copies	W/ Copies

INTERNAL DISTRIBUTION

✓REG FILE	TECH REVIEW	DENTON	LIC ASST	A/T IND
✓AEC PDR	✓HENDRIE	GRIMES	DIGGS (L)	BRAITMAN
✓OGC, ROOM P-506A	SCHROEDER	GAMMILL	GEARIN (L)	SALTZMAN
✓MUNTZING/STAFF	✓MACCARY Ltr	KASTNER	✓GOULBOURNE (L)	B. HURT
✓CASE Ltr	✓KNIGHT	BALLARD	LEE (L)	PLANS
GIAMBUSSO	✓PAWLICKI	SPANGLER	MAIGRET (L)	MCDONALD
BOYD	✓SHAO	ENVIRO	REED (E)	DUBE w/Input
✓MOORE (L)(BWR)	✓STELLO Ltr	MULLER	SERVICE (L)	INFO
DEYOUNG(L)(PWR)	✓HOUSTON	DICKER	SHEPPARD (L)	C. MILES
SKOVHOLT (L)	✓NOVAK	KNIGHTON	SLATER (E)	B. KING (E/W-358)
GOLLER(L)	✓ROSS	YOUNGBLOOD	SMITH (L)	✓KLECKER
P. COLLINS	✓IPPOLITO	REGAN	TEETS (L)	✓EISENHUT
DENISE	✓TEDESCO Ltr	PROJECT LDR	WADE (E)	✓D. THOMPSON (2)
✓REG OPR	✓LONG		WILLIAMS (E)	W/AOR FILE CY
✓FILE & REGION(3)	✓LAINAS	HARLESS	WILSON (L)	
✓MORRIS	✓BENAROYA			
STEELE	✓VOLLMER			

EXTERNAL DISTRIBUTION

✓1 - LOCAL PDR WALHALLA, SC
✓1 - TIC (ABERNATHY)
✓1 - NSIC(BUCHANAN)
1 - ASLB
1 - P. R. DAVIS (AEROJET NUCLEAR)
✓16 - CYS ACRS ~~HOLDING~~
Sent to Lic Asst Goulbourne 5-7-74

(1)(2)(10)-NATIONAL LAB'S
1-ASLBP(E/W Bldg, Rm 529)
1-W. PENNINGTON, Rm E-201 GT
1-CONSULTANT'S
NEWMARK/BLUME/AGBABIAN
1-GERALD ULRIKSON...ORNL
1-B & M SWINEBROAD, Rm E-201 GT

1-PDR-SAN/LA/NY
1-GERALD LELLOUCHE
BROOKHAVEN NAT. LAB
1-AGMED(Ruth Gussman)
RM-B-127, GT.
1-RD..MULLER..F-309 GT

DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28201

A. C. THIES
SENIOR VICE PRESIDENT
PRODUCTION AND TRANSMISSION

P. O. BOX 2178

April 30, 1974

Mr. Angelo Giambusso
Deputy Director for Reactor Projects
Directorate of Licensing
Office of Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545

Re: Oconee Unit 2
Docket No. 50-270

Dear Mr. Giambusso:

My letter of February 1, 1974 transmitted to you, pursuant to Sections 6.2 and 6.6.2 of the Oconee Nuclear Station Technical Specifications, Abnormal Occurrence Report AO-270/74-2, "Seal Leak on Reactor Coolant Pump 2B2." Please find attached a supplemental report, designated AO-270/74-2A, which describes the apparent cause of the seal failure on reactor coolant pump 2B2 and our corrective action.

Very truly yours,

A. C. Thies

A. C. Thies

ACT:gje
Attachment

cc. Mr. N. C. Moseley

4036

DUKE POWER COMPANY
OCONEE UNIT 2
SUPPLEMENTAL ABNORMAL OCCURRENCE REPORT AO-270/74-2A

Supplement Report Date:	April 30, 1974
Occurrence Date:	January 22, 1974
Facility:	Oconee Unit 2, Seneca, South Carolina
Identification of Occurrence:	Seal leak on reactor coolant pump 2B2
Conditions Prior to Occurrence:	Routine startup operation
Description of Occurrence:	As described in Abnormal Occurrence Report AO-270/74-2 dated February 1, 1974

Designation of Apparent Cause of Occurrence:

The seal failure on reactor coolant pump 2B2 was apparently the result of upper seal leakage which, when combined with the seal staging flow, exceeded the capability of the pump heat exchangers. This excessive flow of seal water at 570° F caused the temperature to rise in the seal chamber, distorting the seal faces. This distortion caused even more seal leakage so that the flow increased to the point where the thermal shock caused fracture of the tungsten carbide rotating seal rings. The fractured faces cut the carbon stationary seal rings to the extent that no sealing surfaces remained. Excessive leakage from the upper seal resulted in a pressure buildup within the seal leakage cover until the cover holddown bolts fractured. The seals leakage cover was blown against the seal sleeve nut and shaft nut which were bolted together, holding these nuts stationary and causing the interlocked seal sleeve to thread downward, further opening the seals. It also caused the shaft nut to back off its thread and bear against the coupling hub, thereby generating heat. When the tungsten carbide rotating seal rings fractured, they increased in diameter by wedge action along the fracture plane until they contacted the housings around them and were held stationary. Since the seal rings were restrained from rotating, the tungsten carbide piece remained in position around the sleeve rather than being centrifuged outward. The shaft sleeves and compression rings rotated against the tungsten carbide rings and were cut.

The bearing sleeve, which is shrunk-fit to the pump shaft, showed heat discoloration with heat-crazing over the entire stellite surface. There were smear marks at the center and at both ends of this journal. The failure of this bearing was apparently caused by rapid heating of the bearing cartridge and bearing housing due to the excessive leakage from the pump casing. Heat caused the bearing cartridge and housing to expand outward until they were restrained by the stuffing box, which is water-jacketed. When the cartridge and the housing could no longer expand outward, these parts closed on the shaft journal, causing frictional heat which crazed the stellite overlay on the journal.

Corrective Action:

Following the examination of reactor coolant pump 2B2, it was determined that two distinct, unrelated problems existed: (1) The loss of the impeller cap screw and associated spirol pin; (2) Damage to the bearing and the seals in the pump stuffing box, and the resulting blowoff of the seal leakage cover.

The loss of the impeller cap screw apparently resulted from inadequate retention of the spirol pin that prevents rotation of the capscrew. To correct this situation, another spirol pin has been added so that the capscrew is now locked by two pins. To insure retention of the spirol pins, the outer ends of the spirol pins have been welded to the impeller nut. This corrective action has also been accomplished on all other pumps of this design.

Since it has been determined that the reactor coolant pump seals and bearings failed because the outleakage exceeded the heat rejection capability of the pump heat exchange system, action has been taken to increase the heat exchanger capability and provisions have been added to monitor outleakage.

To increase the heat rejection capability of the heat exchanger system, the flow of component cooling water through this system has been increased to approximately 70 gpm. Flow meters have been installed in the heat exchanger system for each pump so that the flow of component cooling water can be measured to assure proper flow.

A seal leakage monitor, which measures volumetrically the amount of leakage from the upper seal, has been installed in the seal leakage line. This leakage measurement is in addition to the seal leakage alarm furnished with the pump, and is used to assure that leakage is within a safe limit if the alarm actuates. Limits have been established such that seal leakage will remain well below the capability of the heat exchanger. If the established limits are exceeded, the pump will be shut down and the cause of excessive leakage determined and corrected.

In addition to the temperature detecting thermocouples in the recirculating piping and in the seal staging piping, a thermowell has been installed to measure the stuffing box temperature when the pumps are idle. This will allow accurate measurement of the temperature at the lower seal of an idle pump, and will permit better appraisal of the environment of the seals and bearings.

Another thermocouple has been added to determine the temperature of any leakage from the upper seal. When a pump is running in the loss-of-injection mode, this thermocouple can be used to determine the temperature of the seal leakage through the upper seal.

To minimize the effects and amount of outleakage on loss of seal injection flow, and to prevent thermal shock when reestablishing injection flow, the following actions have been taken:

1. There is a time delay associated with automatic closure of the individual seal return valves. This time delay has been reduced from 50 seconds to 5 seconds.

2. An automatic interlock has been added to the common seal return valve to close this valve when all individual seal return valves have been closed.

3. Orifices integral to the reactor coolant pump seal water heat exchangers have been resized to optimize cooler performance.

4. The seal injection flow control valve has been interlocked to automatically close on loss of seal injection. The operator must manually position the valve controller at minimum before it can be reopened and seal flow established.

A seal sleeve lock ring has been installed to prevent seal sleeve movement.

In order to verify pump operability after repair, the initial pump checkout will be repeated. Periodic tests will be conducted after initial checkout, and the data will be evaluated to detect any changes in pump performance.