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)
St. Lucie, Unit 2	0 5 0 0 0 3 8 9	1 OF 0 3

TITLE (4)
Manual Reactor Trip - Reactor Coolant Pump High Vibration

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 9	1 0	8 5	8 5	—	0 0 9	— 0 0	1 0	0 8	8 5	N/A	0 5 0 0 0
											0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)					
POWER LEVEL (10)	0 9 9	20.402(b)	20.405(c)	X	50.73(a)(2)(iv)	73.71(b)	
		20.405(a)(1)(i)	50.36(c)(1)		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
Dave M. Williams, Shift Technical Advisor	AREA CODE 3 0 5 — 4 6 5 - 3 5 5 0

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	
X	A B	M O	A 1 8 0	Y							

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)

EVENT:
Unit 2 was manually tripped from full power when high vibrations occurred on Reactor Coolant Pump (RCP) 2A2.

CAUSE OF THE EVENT:
Shaft vibrations on RCP 2A2 caused damage to internal components of the motor lower oil reservoir. Heat generated when a rotating component began to rub was conducted to other components within the reservoir.

CORRECTIVE ACTIONS:
An investigative team recommended modification to affected components in the oil reservoir to prevent recurrence. Licensee plans to modify RCP 2A2 at this time and inspect the other RCP's during the next scheduled refueling outage.

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
St. Lucie, Unit 2	0 5 0 0 0 3 8 9	8 5	— 0 0 9	— 0 1	0 2 OF 0 3

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

EVENT:

On September 10, 1985, Unit 2 was back at 99.26 percent power following a forced outage initiated by an Engineered Safeguards Trip (see LER 389-85-008). An initial restart attempt was terminated on August 24 when leaking oil from Reactor Coolant Pump (RCP) 2A2 contacted hot Reactor Coolant System (AB) piping and created a small fire. It was determined at that time that vibrations on the pump shaft had led to damage of an oil seal ring in the lower motor reservoir. The damaged internal components of the RCP motor were repaired, the RCP was balanced, and the unit was returned to service on September 9.

At approximately 1912 hours on September 10, a high vibration alarm was again received on RCP 2A2. Based on the magnitude of the vibrations and increasing lower bearing temperatures, it was deemed necessary to stop the pump as soon as possible to prevent further damage. As Technical Specification 3.4.1.1 prohibits operation in modes 1 and 2 with less than four (4) RCP's operating, the reactor was manually tripped at 1920 hours.

All systems functioned as designed following the trip. The Auxiliary Feedwater Actuation System (BA) automatically actuated on low steam generator water level immediately following this trip, as expected. The unit was stabilized in hot standby at 532 degrees and RCP 2A2 was stopped at 1935 hours. An immediate cooldown to 400 degrees was commenced. The purpose of the cooldown was to prevent any oil which might leak out from flashing by reducing piping temperatures to below the oil's 450 degree flashpoint. After a visual verification that no oil had leaked from the motor, the unit was taken to mode 5 for repair.

CAUSE OF THE EVENT:

Inspection of the motor lower oil reservoir components and discussions with vendor representatives have led to the development of the following scenario for the damage to RCP 2A2. It is believed that vibration on the pump shaft caused a rotating oil slinger ring to break free from its position on the outside diameter of the thrust bearing collar. The heat generated when the slinger ring rubbed against its corresponding stationary ring was conducted to other parts of the oil reservoir by the thrust bearing collar. The thrust bearing collar, which has an interferance fit on the shaft, was loosened as the metal expanded, causing the vibration to increase to the point where it was necessary to trip the pump.

The conducted heat also damaged an oil seal in the oil reservoir. Similar damage was found following the oil fire previously noted; however, the oil seal had not been damaged in a way that oil would have been lost during this event. It was determined that the oil seal would have to fail in a specific geometry such that the seal would act as an impeller to pump out small quantities of oil.

SAFETY ASSESSMENT:

Strip chart recordings from this trip were compared with recordings from a Unit 1 trip on March 7, 1985, (see LER 335-85-003) as part of the post-trip review

process. Although the causes were different, both events resulted in a trip from full power with no subsequent problems. No deficiencies were noted. Although RCP 2A2 was stopped soon after trip, the remaining RCP's provided sufficient flow for a forced circulation cooldown.

The RCP's are not a safety system. At no time was the integrity of the Reactor Coolant System (AB) challenged. The Reactor Protective System (JC) reactor coolant flow trip provides automatic reactor trip for loss of a RCP.

The consequences of an oil fire on the RCP are mitigated by the fire detection system, which provides early detection of a fire, and the lack of combustibles in the area of the RCP. Damage to systems essential to safe shutdown is therefore precluded.

CORRECTIVE ACTIONS:

1. Initial corrective actions were to disassemble the pump and repair the damaged oil ring and oil seal.

2. A team composed of members of the plant staff, plant engineering, and vendor representatives was formed to investigate the root cause of the RCP problem. The team has recommended modification to the oil ring and oil seal to increase clearances and preclude them breaking away from their mounting points.

3. The licensee plans to only modify RCP 2A2 at this time. The other RCP's will be inspected during the next refueling outage.

4. Following reassembly, the motor, coupling, and pump were realigned to rectify the initial vibration problem.

P.O. BOX 029100 MIAMI, FL 33102

October 10, 1985
L-85-380

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

Gentlemen:

Re: Reportable Event 85-9
St. Lucie Unit 2
Date of Event: September 9, 1985
Manual Reactor Trip - Reactor Coolant
Pump High Vibration

The attached Licensee Event Report is being submitted pursuant to the requirements of 10 CFR to provide notification of the subject event.

Very truly yours,

for C.W. Woody
J.W. Williams, Jr.
Group Vice President
Nuclear Energy

JWW/SAV:mls

Attachment

cc: Dr. J. Nelson Grace, Region II, USNRC
Harold F. Reis, Esquire
File 933.1

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