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)
CRYSTAL RIVER UNIT 3	0 5 0 0 0 3 0 2	1 OF 0 4

TITLE (4)
LOSS OF DECAY HEAT REMOVAL CAPABILITY

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)
									N/A	0 5 0 0 0
0 2	0 2	8 6	8 6	— 0 0 3	— 0 1	0 5	1 5	8 6	N/A	0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iii)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(iv)	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
	AREA CODE
L. W. MOFFATT, Nuclear Safety Supervisor	9 0 4 7 9 5 - 3 8 0 2

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	B P	P	W 3 1 8	Yes							
X	B P	I S V	C 2 5 5	Yes							

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X YES (If yes, complete EXPECTED SUBMISSION DATE)	NO		0 9	0 1	8 6

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

On February 2, 1986, Crystal River Unit 3 was in Mode 5 while performing repairs on a reactor coolant pump. The Reactor Coolant System was vented to the reactor building atmosphere and drained below the level of the reactor coolant pumps. At 2148 hours, decay heat pump 1B tripped due to a motor overload caused by a pump shaft failure. Start-up of the redundant pump was delayed because an isolation valve on the suction side of the pump could not be opened from the control room. The valve was manually opened and system operation was restored at 2212 hours. On February 14, 1986, the "B" train of the Decay Heat Removal System was being refilled and movement of the pump and piping was noticed. Examination of pipe restraints in the system revealed that several pipe hangers were loose or damaged.

All damaged equipment has been repaired. Both decay heat pumps have been rebuilt. Decay Heat Removal System operating procedures have been revised to address minimum required reactor coolant level and provide improved fill and vent instructions. New breaker and torque switch settings have been established for the isolation valve. Preventative maintenance procedures will require periodic lubrication of the valve drive shaft.

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EVENT DESCRIPTION

On February 2, 1986, Crystal River Unit 3 was in Mode 5 (Cold Shut- down) while performing repairs on a reactor coolant pump [AB, P]. The Reactor Coolant System was vented to the reactor building atmosphere and reactor coolant level was below the level of the reactor coolant pumps. Reactor coolant temperature, measured at the incore thermocouples, was being maintained at approximately 98 degrees F. by the "B" train of the Decay Heat Removal System [BP]. At 2148 hours, decay heat pump 1B [BP, P] (DHP-1B) tripped due to a motor overload. Action was immediately taken to place the "A" train of the Decay Heat Removal System in operation. Start-up of the "A" train was delayed for approximately 24 minutes because isolation valve DHV-39 [BP, ISV] on the suction side of decay heat pump 1A [BP, P](DHP-1A) could not be opened from the control room (see Figure 1). Valve DHV-39 was manually opened and Decay Heat Removal System operation was restored at 2212 hours. The reactor coolant temperature reached 131 degrees F. during the period that decay heat removal capability was unavailable.

On February 14, 1986, following repairs to DHP-1B, the "B" train of the Decay Heat Removal System was being refilled in preparation for operability testing. Personnel observing the refilling process noticed movement of the pump and piping when water was admitted to the system. Examination of pipe restraints [BP, H] in the Decay Heat Removal System revealed that several restraints in the vicinity of DHP-1B were loose or damaged.

CAUSE

The motor of DHP-1B overloaded and tripped as a result of a failed pump shaft. The exact cause of the shaft failure has not been determined. Preliminary analysis tends to indicate the presence of a stress corrosion cracking phenomenon which could have contributed to the failure. Another contributor to the shaft failure could have been pump air entrainment caused by vortexing due to the low reactor coolant level. However, it cannot be established that vortexing actually occurred.

Investigation into the cause for the failure of DHV-39 to open on demand showed several problems. Lubrication of the operator drive shaft and universal joints may have been inadequate, causing excess resistance to movement. The operator torque switch setting was too low and the circuit breaker setpoint was too low for the motor load.

The pipe hangers were damaged by excessive loads experienced during the failure of the pump or by hydraulic stressing (water hammer) during the system refill process.

SAFETY CONSIDERATIONS

The loss of a single train of the Decay Heat Removal System (failure of DHP-1B) did not compromise plant safety. The inability to open valve DHV-39, combined with the failure of DHP-1B, caused both trains of the Decay Heat Removal System to be unavailable for a brief period. There were several alternative methods available to remove decay heat. Therefore, this event did not present an immediate safety threat.

CORRECTIVE ACTIONS

Decay heat p[illegible] 1B and the damaged pipe hangers have been repaired and the pump has been returned to service. The rotating assembly of the undamaged redundant decay heat pump (DHP-1A) has also been replaced. This was done as a precautionary measure since the exact cause of the DHP-1B shaft failure has not been determined. Decay Heat Removal System operating procedures have been revised and now provide precautionary information on minimum reactor coolant levels required for decay heat pump operation. The Decay Heat Removal System fill and vent instructions have been revised to minimize the possibility of water hammer.

The breaker trip setpoints for DHV-39 and DHV-40 (DHP-1B suction side valve) have been increased to accommodate the motor operator load. The operator drive shafts and universal joints have been lubricated and the torque switch setting for DHV-39 has been increased to the proper value. The torque switch setting for DHV-40 did not require adjustment. Preventative maintenance procedures will be revised to require periodic lubrication of the drive shafts and universal joints.

SIMILAR PREVIOUS EVENTS

There have been three (3) previous decay heat pump shaft failures at Crystal River Unit 3. These failures were all experienced on decay heat pump 1A and attributed to a distorted waterway in the pump casing.

Inability to open decay heat pump suction valves DHV-3 and DHV-4 (drop line isolation valves) has occurred on several previous occasions. Problems opening DHV-39 against high differential pressure have been encountered, however, no other types of failures have been documented. Isolation valve DHV-39 was originally a manually operated valve. Its motor operator was installed in response to a NUREG 0578 item.

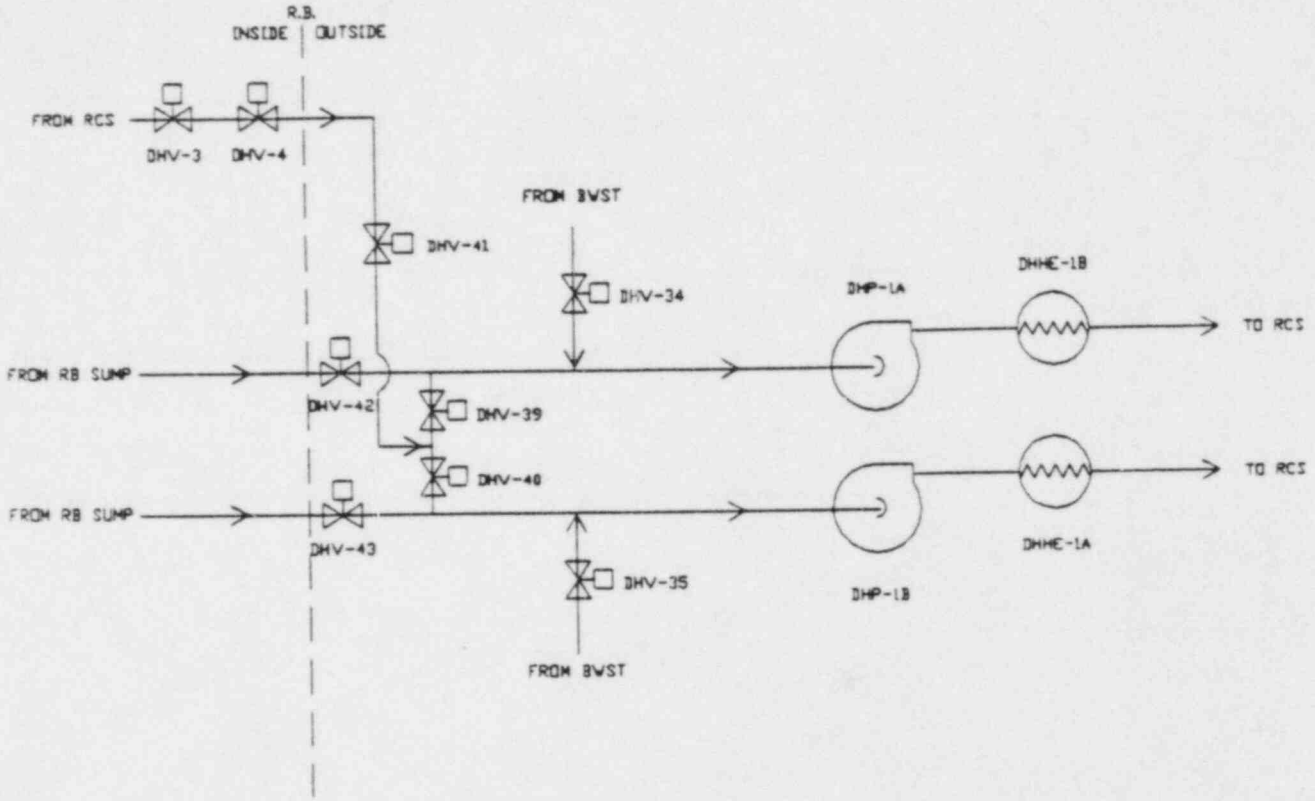
R.B.
INSIDE
OUTSIDE
FROM RCS
DHV-3
DHV-4
FROM BWST
DHV-41
DHV-34
DHP-1A
DHHE-1B
TO RCS
FROM RB SUMP
DHV-42
DHV-39
DHV-40
TO RCS
FROM RB SUMP
DHV-43
DHHE-1A
DHV-35
DHP-1B
FROM BWST

FIGURE 1

Florida Power
CORPORATION

May 15, 1986
3F0586-17

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

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
Licensee Event Report No. 86-003-01

Dear Sir:

Enclosed is Licensee Event Report (LER) No. 86-003-01 which is submitted in accordance with 10 CFR 50.73.

Should there be any questions, please contact this office.

Sincerely,

Rolf C. Widell
Manager, Nuclear Operations
Licensing and Fuel Management

AEF/feb

Enclosure

xc: Dr. J. Nelson Grace
Regional Administrator, Region II
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
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Atlanta, GA 30323

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