Florida Power
CORPORATION

Crystal River Unit 3
Docket No. 50-302

May 20, 1991
3F0591-12

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

Subject: Licensee Event Report (LER) 91-003

Dear Sir:

Enclosed is Licensee Event Report (LER) 91-003 which is submitted in accordance with 10 CFR 50.73.

Sincerely,

Rolf C. Widell
Director, Nuclear Operations Site Support
Nuclear Production

WLR:mag

Enclosure

xc: Regional Administrator, Region II
NRR Project Manager
Senior Resident Inspector

IE22
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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
CRYSTAL RIVER UNIT	0 5 0 0 0 3 0 2	1 OF 0 5

TITLE (4) Water Instrusion Into Pump Motor Leads to Lo of Circulating Water Pump, Emergency Feedwater Actuation, and a Manual Reactor Trip

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 4	2 0	9 1	9 1	— 0 0 3	— 0 0	0 5	2 0	9 1	N/A	0 5 0 0 0
									N/A	0 5 0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

OPERATING MODE (9)	1							
POWER LEVEL (10)	0 4 7	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
W. K. BANDHAUER, NUCLEAR OPERATIONS SUPERINTENDENT	AREA CODE 9 0 4 — 7 9 5 - 6 4 8 6

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	
C	K E	M O	W 1 2 0	NO							

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)

On April 20, 1991, Crystal River Unit 3 was operating in MODE 1, at 47% rated thermal power, performing Main Condenser water box and Circulating Water Pump maintenance. Two of the four condenser water boxes were out of service. At 0650, Circulating Water Pump 1A tripped. This removed cooling from the A condenser and from the Secondary Services Closed Cycle Cooling Water System (SC) which provides cooling to turbine and generator equipment. CWP-1D continued to supply its main condenser with cooling water.

The operators began rapidly reducing power to take the turbine off line, then tripped the turbine when numerous turbine temperature alarms were received. Following the turbine trip, a feedwater transient occurred resulting in an Anticipated Transient Without Scram Mitigation System (AMSAC) actuation of Emergency Feedwater. Indications of loss of main feedwater and initiation of emergency feedwater at power caused the operators to manually trip the reactor.

The cause of this event was water intrusion into the circulating water pump motor during a severe rainstorm. Corrective action will be to provide additional rain protection for the circulating pumps.

EVENT DESCRIPTION

On April 20, 1991, Crystal River Unit 3 was operating in MODE 1, at 47% rated thermal power (RTP). Power had been reduced to about 75% three weeks earlier for condenser water box [KE,COND] maintenance and Circulating Water Pump [KE,P](CWP) maintenance. Power was subsequently reduced to 47% on 4/19/91 at about 1425, when condenser water box C developed a leak forcing its removal from service. This left the plant in the unusual condition of having only two functioning waterboxes, one in each condenser. Secondary Services Closed Cycle Cooling Water System [KB] (SC) was being cooled by seawater from the 1A Circulating Water Pump [KE,P] (CWP-1A).

At 0650, CWP-1A tripped. This left one water box functional in condenser "B" and none in condenser "A". It also left the secondary plant equipment such as the main turbine oil coolers, generator hydrogen cooler, etc. without cooling because the "A" Secondary Services heat exchanger [KB,HX] was no longer receiving cooling water flow from the circulating water system. (See the attached drawing.)

The operators immediately began a run back of the plant at the maximum controllable rate. The operator's goal was to reduce power to <15% RTP, take the main turbine off line, and stabilize the plant. The operators also ordered the turbine building operator to place the 'B' Secondary Services Cooling heat exchanger in service because it would be supplied with cooling water from the remaining CWP on the "B" side condenser.

At 0653, before the "B" SC heat exchanger could be placed in service, alarms occurred on turbine differential expansion. This indicated that the loss of SC cooling water was beginning to adversely effect plant equipment. The shift supervisor instructed the operators to manually trip the turbine to protect plant equipment. When the turbine was tripped, power level was below the Anticipatory Reactor Trip System [JC] (ARTS) setpoint (45% RTP), so there was no automatic reactor trip.

At 0654, the Anticipated Transient Without Scram Mitigation System Actuation Circuitry [JE] (AMSAC) activated the Emergency Feedwater Initiation and Control [BA](EFIC) system, starting both Emergency Feedwater Pumps [BA,P] (EFPs), and feeding both steam generators. The operators reviewed their indications and realized there was inadequate main feedwater flow for their present power level and that EFW flow to both steam generators was occurring. In accordance with normal and abnormal operating procedure guidance, the operators tripped the reactor. The combination of main and emergency feedwater flow caused the reactor coolant system to cool down approximately 8 degrees fahrenheit below the nominal post trip temperature. The resulting decrease in pressurizer water level required the operators to start a second makeup pump [BQ,P] and open two High Pressure Injection nozzle valves [BQ,FCV] to increase the supply of water to the reactor coolant system. The second nozzle valve was open for 15 seconds and then closed because pressurizer level was recovering from the low level condition.

The operators took manual control of main feedwater, verified that it responded properly, and stopped Emergency Feedwater. The operators then reset the AMSAC and EFIC systems. The elapsed time from CWP-1A trip to reactor trip was four minutes and forty three seconds.

This event is being reported as required by 10 CFR 50.73(a)(2)(iv), because it involved the actuation of the Reactor Protection and Emergency Feedwater Systems.

CAUSE

The cause of this event was water intrusion into the circulating water pump motor during a severe storm leading to a trip of CWP-1A. The water intrusion degraded the motor winding insulation and caused a short circuit in the motor.

The cause of the AMSAC actuation was a set of valid input signals. The input signals for Reactor Power and FW Flow met their setpoint values for the actuation. Actuation conditions for AMSAC are reactor power greater than 25% rated thermal power and feedwater flow less than 17% on both the main feedwater and startup feedwater flow channels. Immediately following the turbine trip, the steam generator pressure increased by about 150 pounds per square inch. This pressure increase caused a feedwater flow transient which resulted in feedwater flow decreasing to zero for a few seconds. Because reactor power had not yet decreased below 25%, AMSAC actuated Emergency Feedwater flow.

The immediate cause of the manual reactor trip was the recognition by the operators that main feedwater was acting improperly and that Emergency Feedwater was flowing to both steam generators with reactor power greater than 5% RTP. The reactor trip was not mandated by procedure. However, there is guidance provided by procedure to minimize the amount of time the reactor is critical with emergency feedwater flow to the OTSGs. Additionally, there are cautionary notes in the procedures that instruct the operators not to leave the reactor critical unless main feedwater (MFW) will be recovered immediately. The operators believed they had lost main feedwater flow and that there was a problem with feedwater control. The shift supervisor looked at the indications for Main and Emergency feedwater flow, steam generator levels, reactor power, main condenser cooling and decided to place the reactor in a known safe state.

EVENT EVALUATION

There was no threat to the health and safety of the general public from this event. There was no release of radioactive material above Technical Specification limits. Since the reactor trip was manually initiated by the operators, the Reactor Protection System setpoints were not reached. All safety systems responded as designed.

Under a different set of initial conditions, three water boxes in service and only one out for maintenance, this event would not have occurred. Having both SC heat exchangers in service simultaneously would also have prevented this event.

CORRECTIVE ACTION

A plant modification had previously been initiated to provide protection of the circulating water pump from water intrusion during rainstorms. An interim cover has been erected over the pumps and a permanent structure will be erected.

Florida Power is considering additional actions to prevent recurrence of this event. These include changes to AMSAC initiation setpoints and providing operators with additional guidance on operation of the SC system with condenser waterboxes out of service.

PREVIOUS SIMILAR OCCURRENCES

There have been five previous failures of the CWPs during rainstorms; these were attributed to lightning. Surge protection was installed to correct the problem. None of these previous events caused the loss of SC cooling and none required the manual trip of either the turbine or reactor as did this event.

CW AND SC SYSTEM SCHEMATIC DIAGRAM