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On July 2, 1987, Crystal River Unit 3 was operating at 88.4% Rated Thermal Power, generating 771 MWe. Surveillance testing on Channel B of the Reactor Protection System was in progress. The B Control Rod Drive Mechanism (CRDM) circuit breaker opened normally when the shunt trip device was tested, but would not reclose after testing.

While investigation into the B CRDM breaker problem was in progress, the inverter supplying power to the A vital bus failed. The A vital bus automatically transferred to its alternate power source. During the transfer the bus experienced a slight voltage dip which caused the A CRDM breaker to open. Since both breakers were open simultaneously, all power was removed from the control rod drive mechanisms. This caused all control rods to fail to the fully inserted position and shut down the reactor. The CRDM breaker that would not close has been replaced. The inverter has been repaired and a modification has been prepared to lower the undervoltage setpoint.

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YES III yes, complete EXPECTED SUBMISSION DATE!

ASSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (18)

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EXPECTED

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION APPROVED OMB NO. 3150-0104

		EXPIRES 8/31/85
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (8) PAGE (3)
COVETAL DIVER NINGT #2		YEAR SEQUENTIAL REVISION NUMBER
CRYSTAL RIVER UNIT #3	0 5 0 0 0 3 0	2 8 17 - 01019 - 010 012 OF 0 13

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

EVENT DESCRIPTION

On July 2, 1987, Crystal River Unit 3 was operating at 88.4% Rated Thermal Power, generating 771 MWe. Reactor Protection System [JC] functional testing was in progress on the B Channel. At 1032, the B Control Rod Drive Mechanism (CRDM) breaker [AA, BKR] (as opened by the shut trip device [AA, BKR] as part of the surveillance, but could not be reclosed following the test.

Troubleshooting of this problem was in progress at 1042, when the inverter [EF, INVT] supplying power to the A vital Bus [EF, BU] failed. (This failure was not related to the problem with the B CRDM breaker.) The loads on the A vital bus were automatically transferred to the alternate AC power source [EB, XFMR] when the inverter failed, However, the A CRDM bre ker opened during the transfer. Opening of the A CRDM breaker while the B CRDM breaker was open removed all power from the control rod drive mechanisms. This caused all the control rods [AA] to fall to the fully inserted position, shutting down the reactor. Opening of both CRDM breakers also caused an automatic turbine [TA] The Reactor Protection System anticipatory reactor trip was actuated when the turbine trip occurred.

CAUSE

This event was initiated by the failure of the inverter supplying power to the A vital bus while the B CRDM breaker was open. The cause of the event was opening of the A CRDM breaker due to the A vital bus experiencing a voltage dip during the time between transfer from normal source power to the alternate power source. The combination of a voltage dip and a time lag to transfer caused the undervoltage sensor to actuate and trip the breaker open.

The inverter failed because a capacitor [EF,CAP] in the square wave switching circuit failed. The cause of the capacitor failure is under investigation.

The cause of the failure of the B CRDM breaker to reclose has not been determined.

CORRECTIVE ACTION

The capacitor that failed, and all capacitors in the same bank, in the A vital bus inverter have been replaced. An investigation will be conducted to determine the cause of the capacitor failure.

The B CRDM breaker has been replaced and tested satisfactorily. analysis will be conducted to determine why the breaker that was removed would not reclose during surveillance testing.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION APPROVED OMB NO 3150-0104

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	EXPIRES: 8/31/85						
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)				
CRYSTAL RIVER UNIT #3		YEAR SEQUENTIAL REVISION NUMBER					

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

It has been recognized that a voltage dip below the setpoint is experienced during the transfer to the alternate source. modification has been prepared and scheduled for installation during the Refuel VI outage to lower the undervoltage setpoint. It is expected the new setpoint will be lower than the voltage dip experienced during the transfer.

SAFETY CONSIDERATIONS

The opening of the A CRDM breaker was a conservative action which occurred because of the design setpoint of the shunt trip undervoltage sensor. The failure of the B CRDM breaker to reclose did not interfere with its ability to perform its safety function, since opening and remaining open is the safety function of the breaker. The Reactor Protection System (Anticipatory Reactor Trip) was the only safety system challenged during this event and it responded as expected. The reactor was safely shut down and there were no inadvertent releases of radioactive material as a result of this event. Therefore, public health and safety were not affected.

PREVIOUS SIMILAR EVENTS

Two previous similar events were identified in which inverter problems led to reactor trips. LER 81-21 reported an inverter failure which resulted in a partial loss of Non-Nuclear Instrumentation power and a reactor trip. LER 85-23 reported an inverter problem, which resulted in the plant operators manually tripping the turbine, causing a reactor trip.



August 3, 1987 3F0887-02

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

Subject: Crystal River Unit 3 Docket No. 50-302

> Operating License No. DPR-72 Licensee Event Report No. 87-09-00

Dear Sir:

Enclosed is Licensee Event Report (LER) No. 87-09-00 which is submitted in accordance with 10 CFR 50.73.

Should there be any questions, please contact this office.

Sincerely,

E. C. Simpson

Director, Nuclear

Operations Site Support

WLR:mag

Enclosure

xc: Dr. J. Nelson Grace Regional Administrator, Region II

> Mr. T. F. Stetka Senior Resident Inspector